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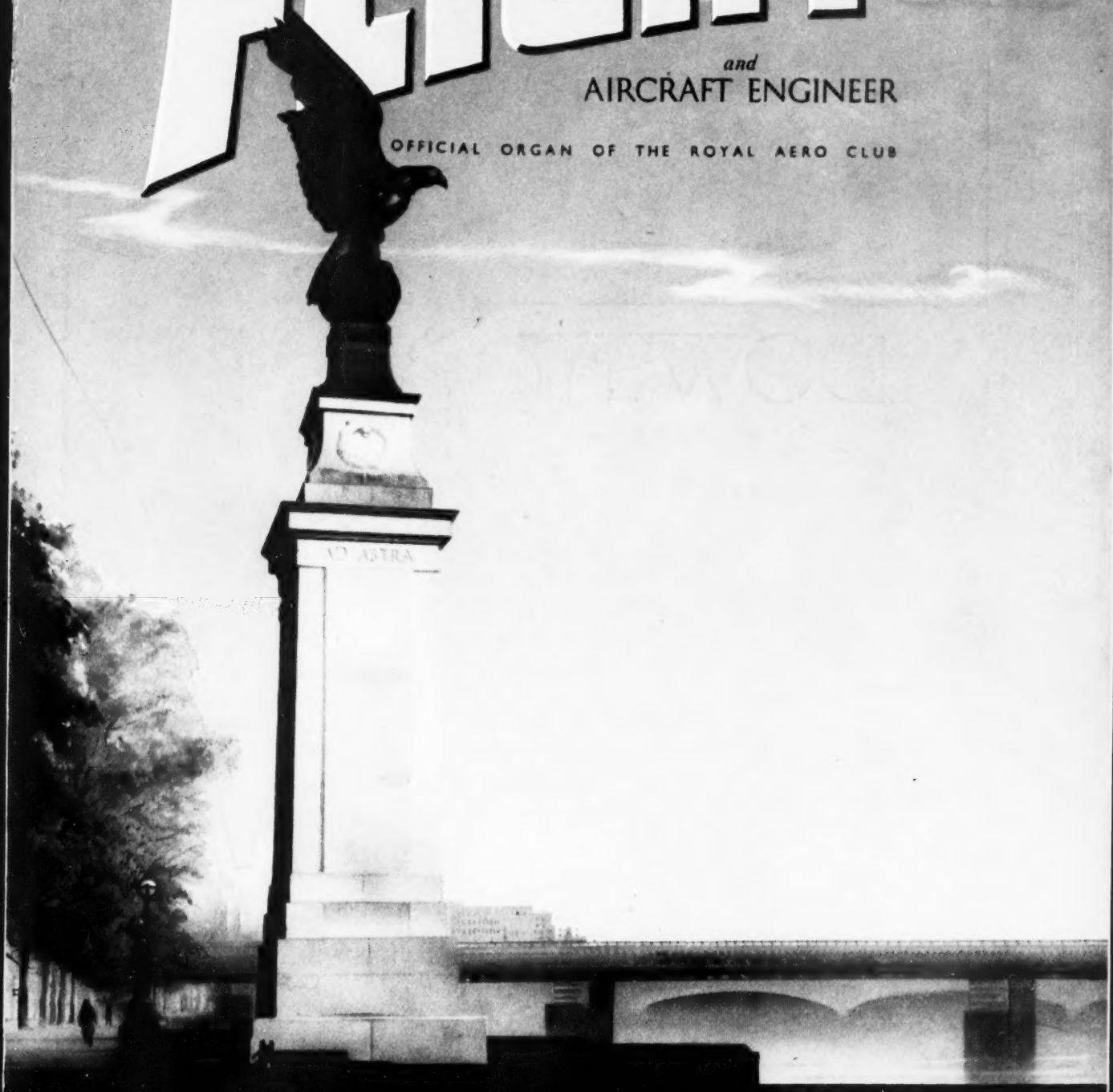

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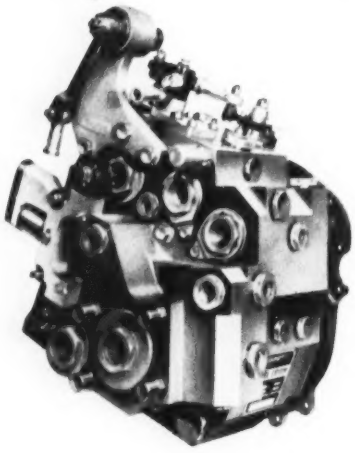
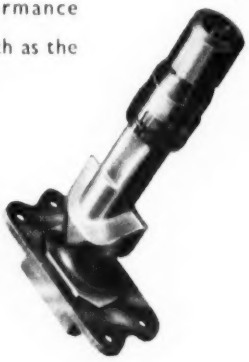


Contributing to Britain's leadership in gas turbine engine design, the many unique features of the Dowty Spill Flow Fuel System further enhance already outstanding performance characteristics of aircraft such as the D. H. Venom Night Fighter.

Circulating pump and valve group unit



A Dowty Spill Burner

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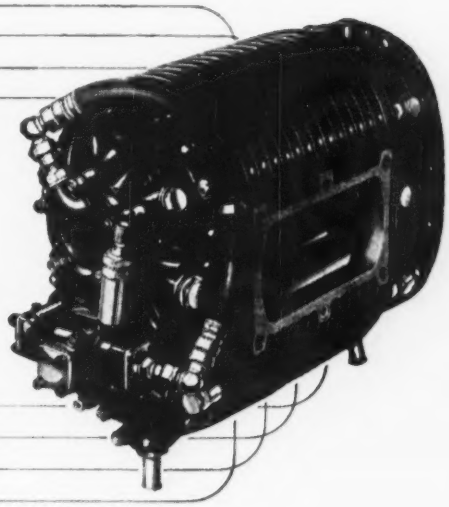
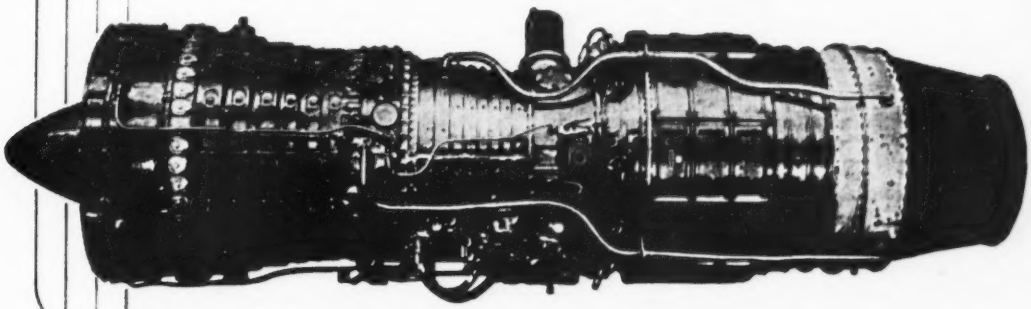
Cabin superchargers . . . ?



. . . . or Engine tapped . . . ?



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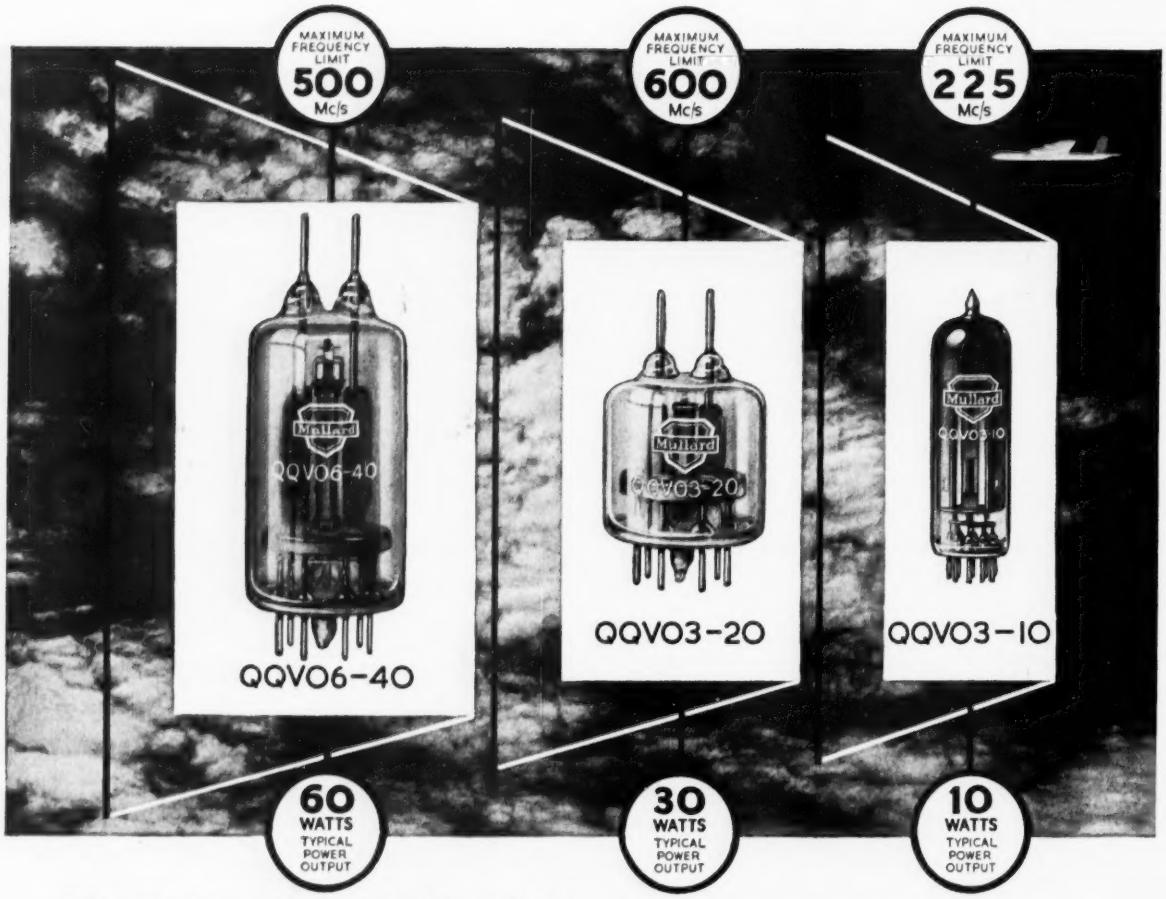

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			SERIES	PARALLEL	Va max (V)	pa max (W)	Vg2 max (V)	pg2 max (W)	Ik max (mA)
QQV06-40	R.F. Power Double Tetrode	B7A	12.6 0.9	6.3V 1.8A	600	2 x 20	250	2 x 3	2 x 120
QQV03-20	R.F. Power Double Tetrode	B7A	12.6 0.65	6.3V 1.3A	600	2 x 10	250	2 x 1.5	2 x 55
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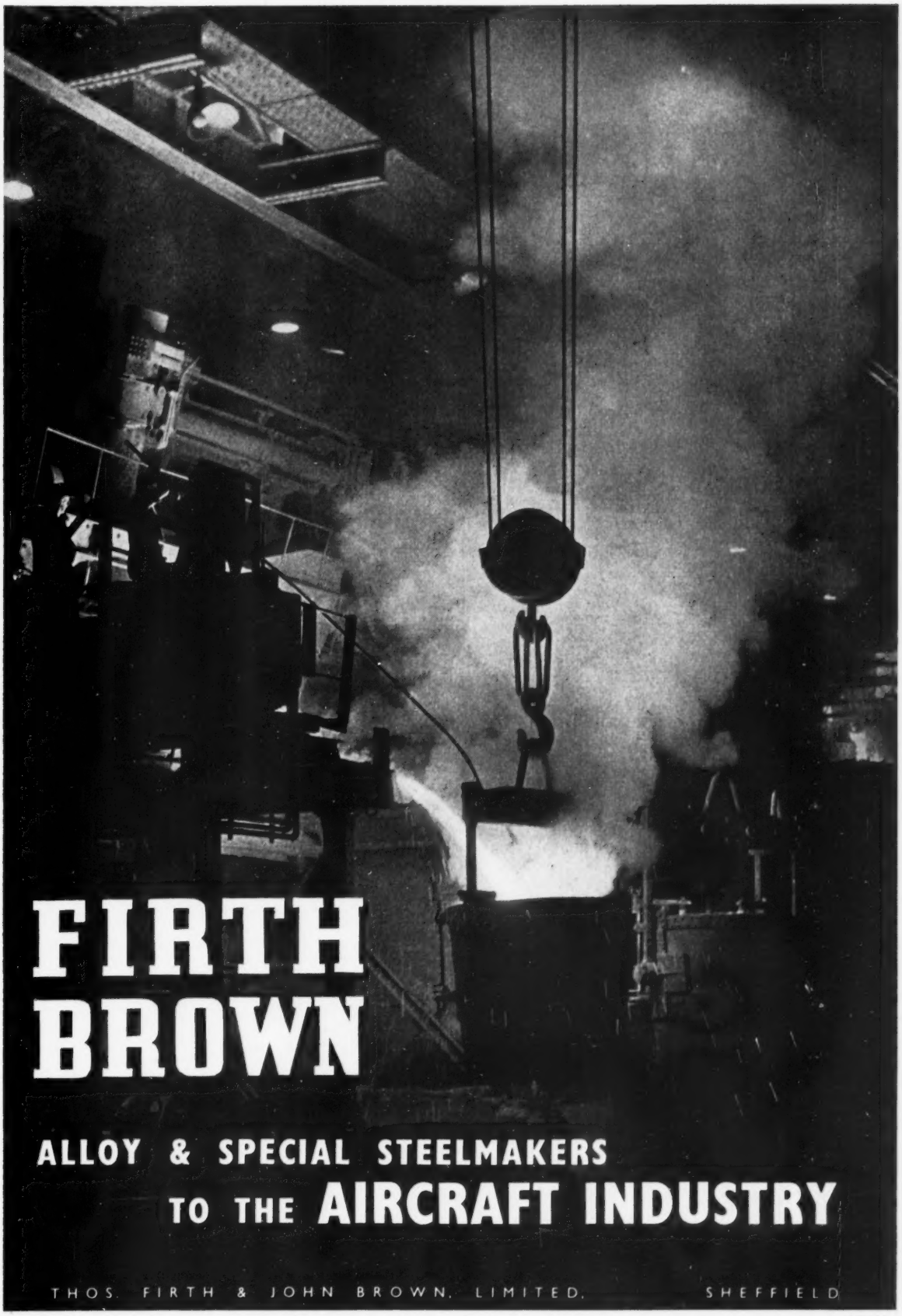
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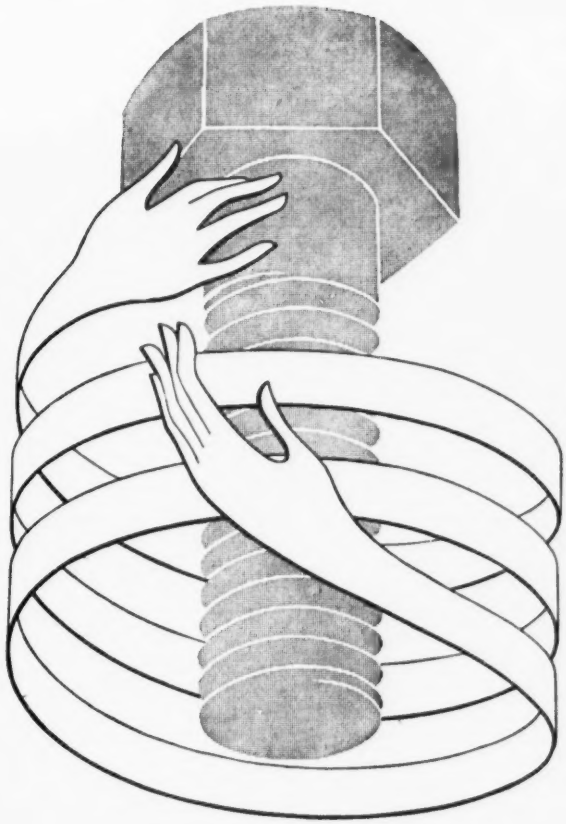

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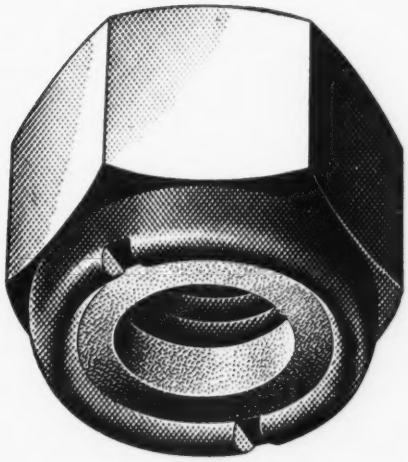

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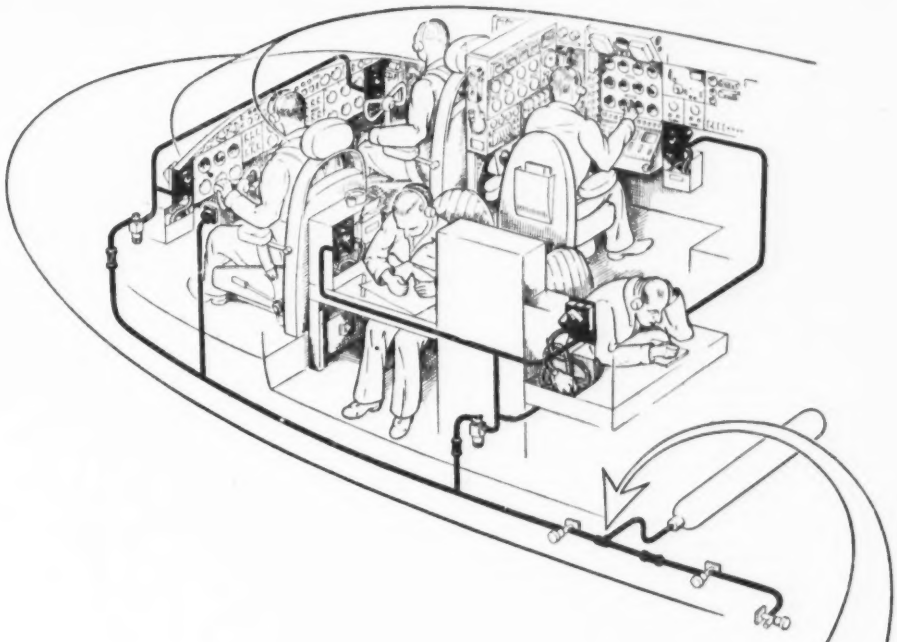

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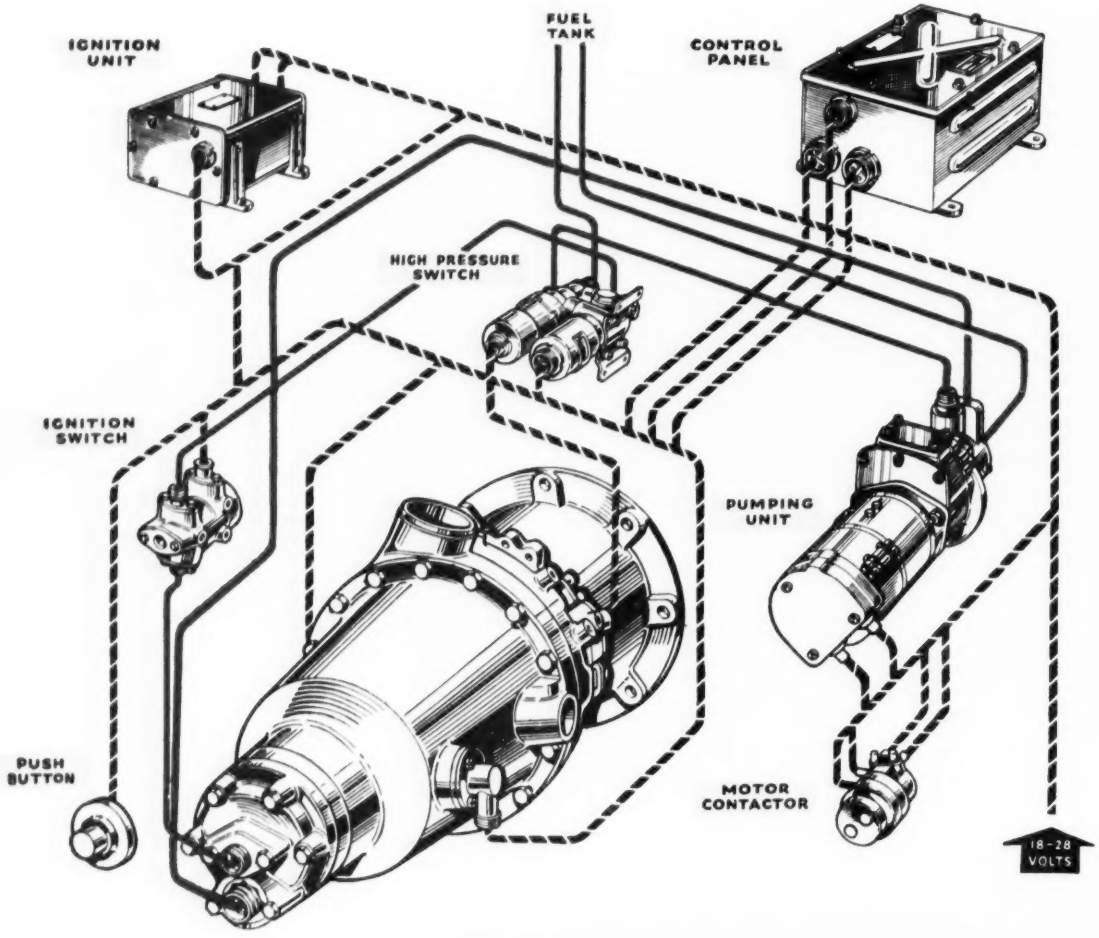

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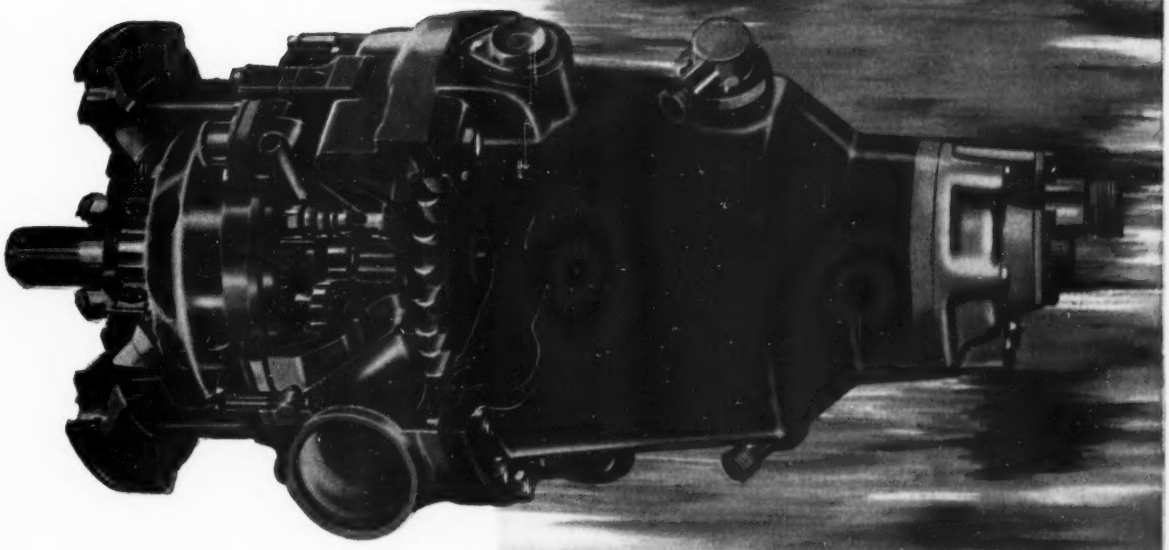

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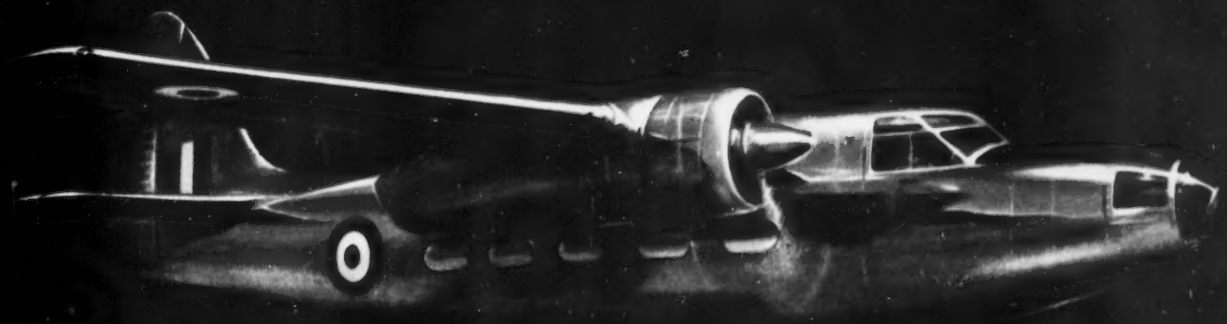

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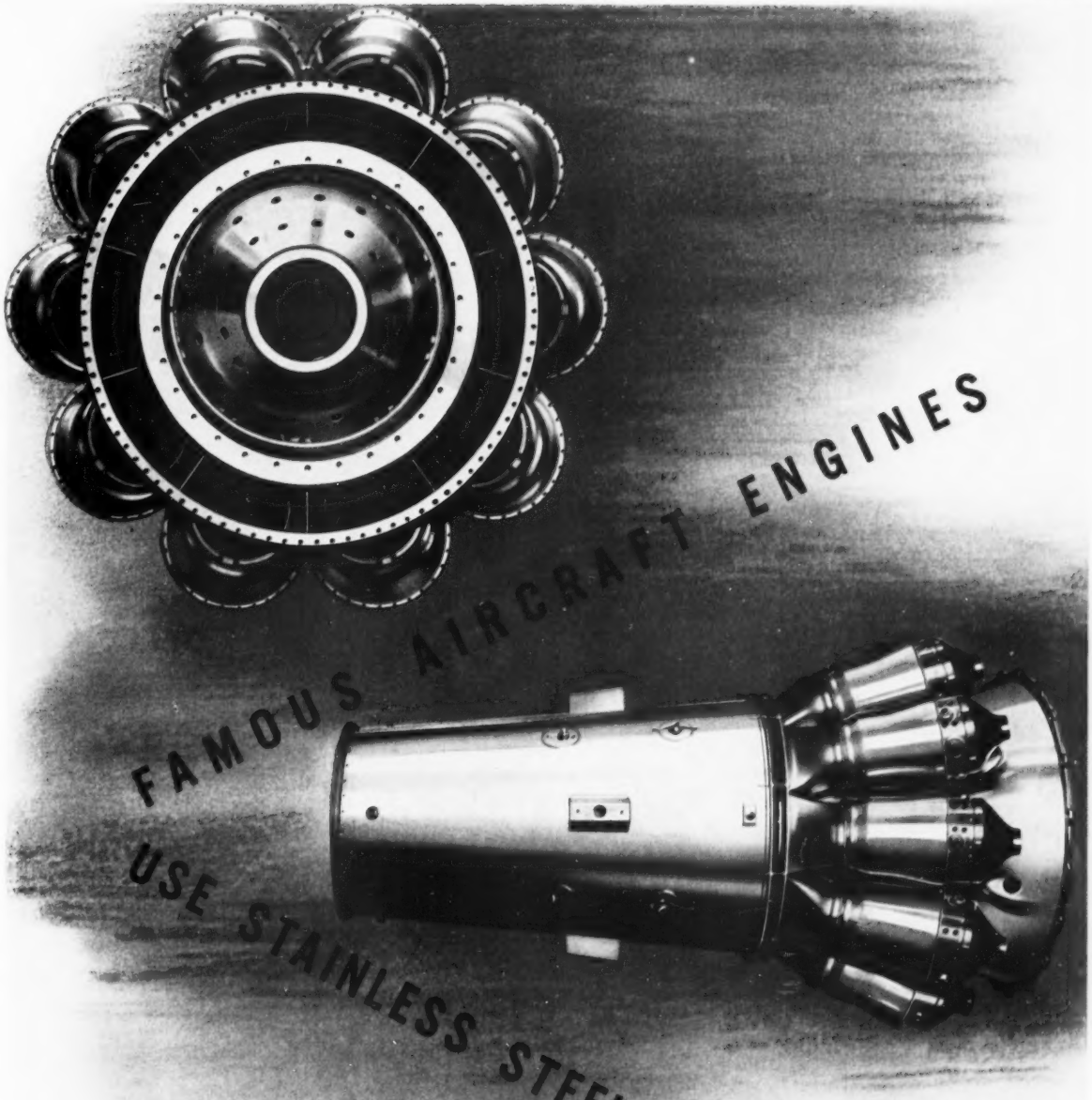

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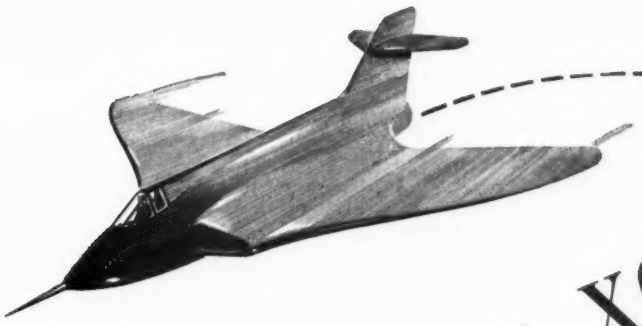

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The subjects dealt with in a striking series of illustrated articles range from the newest British aircraft, military and civil, to the England-New Zealand air race, from the future use of helicopters to aviation's aid to agriculture, from aero-engine characteristics to interplanetary travel prospects, from supersonic "bangs" to special aviation fuels, from the College of Aeronautics to air cargo development, and from airline catering to parachute progress.

The contributors include: Air Chief Marshal Sir Ralph H. Cochrane; Sir Alan Cobham; Squadron Leader Neville Duke; Professor A. A. Hall; Air Marshal Sir Victor Goddard; Captain O. P. Jones; Dr. S. G. Hooker; Lord Douglas of Kirtleside; Philip A. Wills; E. L. Bass; W. D. Brown; A. V. Cleaver; Oliver Stewart; Rear-Admiral M. S. Slattery; G. T. Harris; James Martin; Captain A. G. Lamplugh; W. E. P. Johnson; Denis Desoutter; F. G. Miles; D. A. Oliver; B. S. Shenstone; E. Colston Shepherd; J. Hay Stevens; R. T. West; H. F. King; F. T. Meacock; W. M. Widgery.

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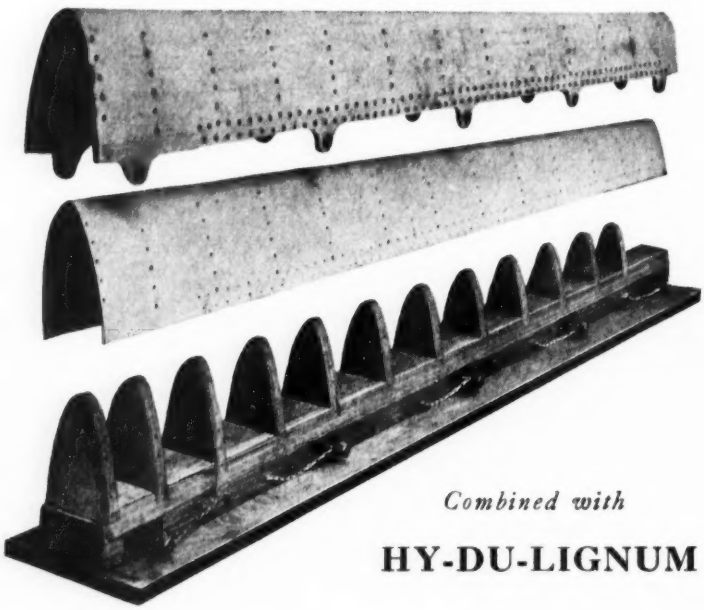

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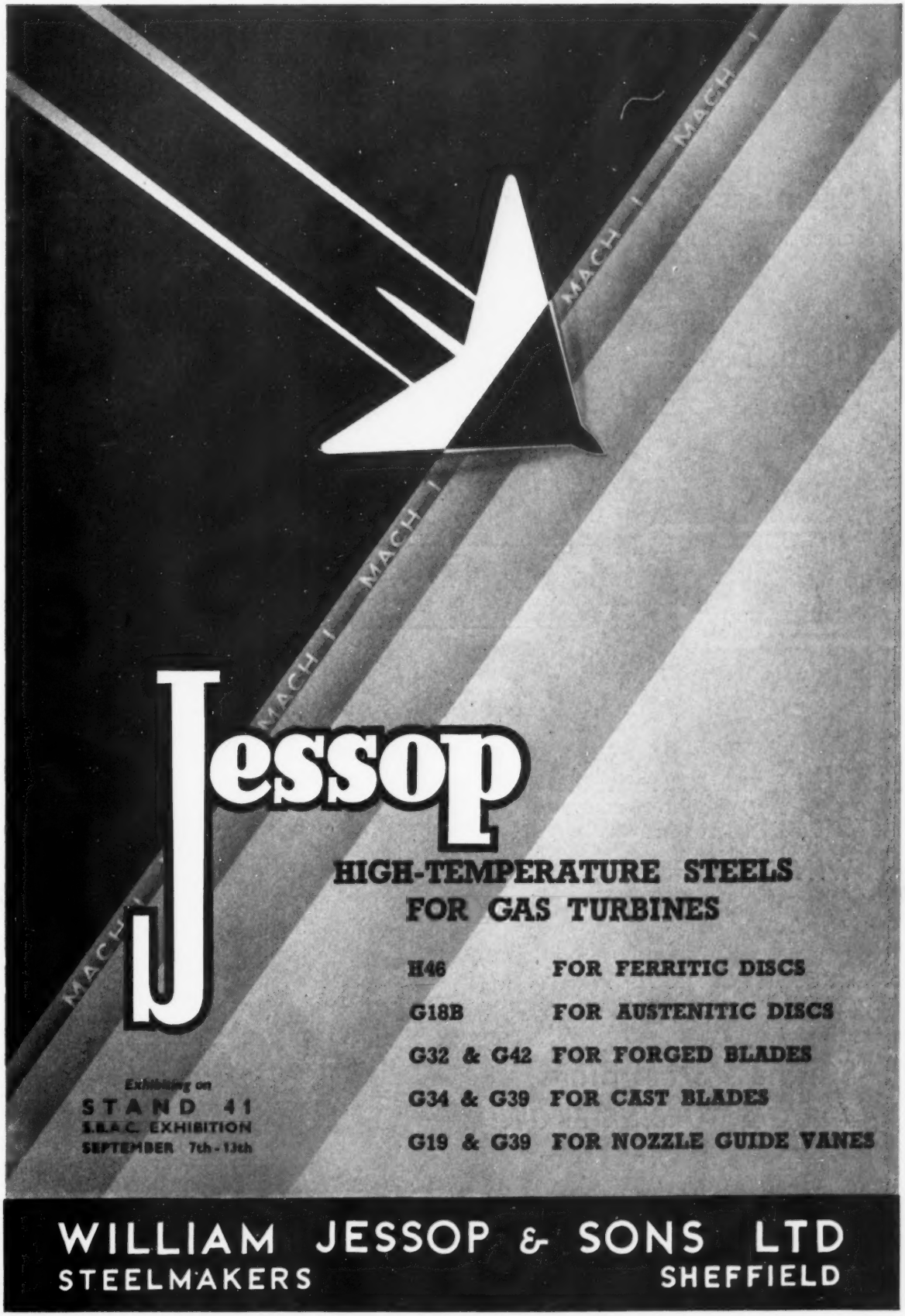
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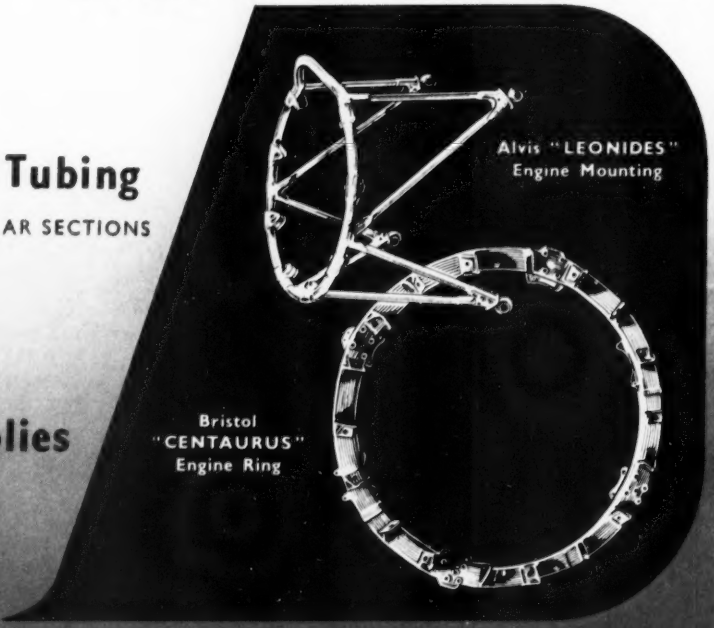

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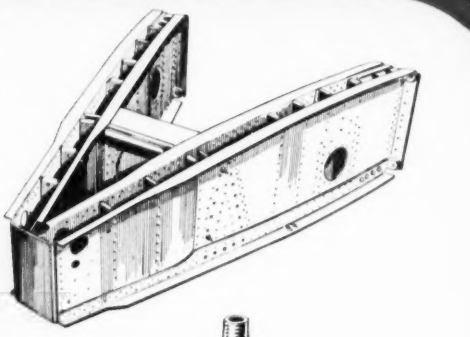

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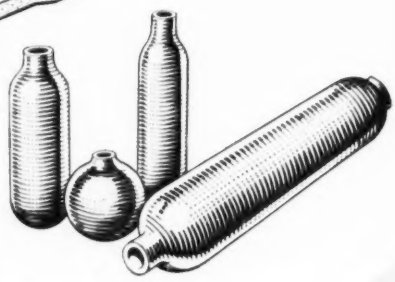

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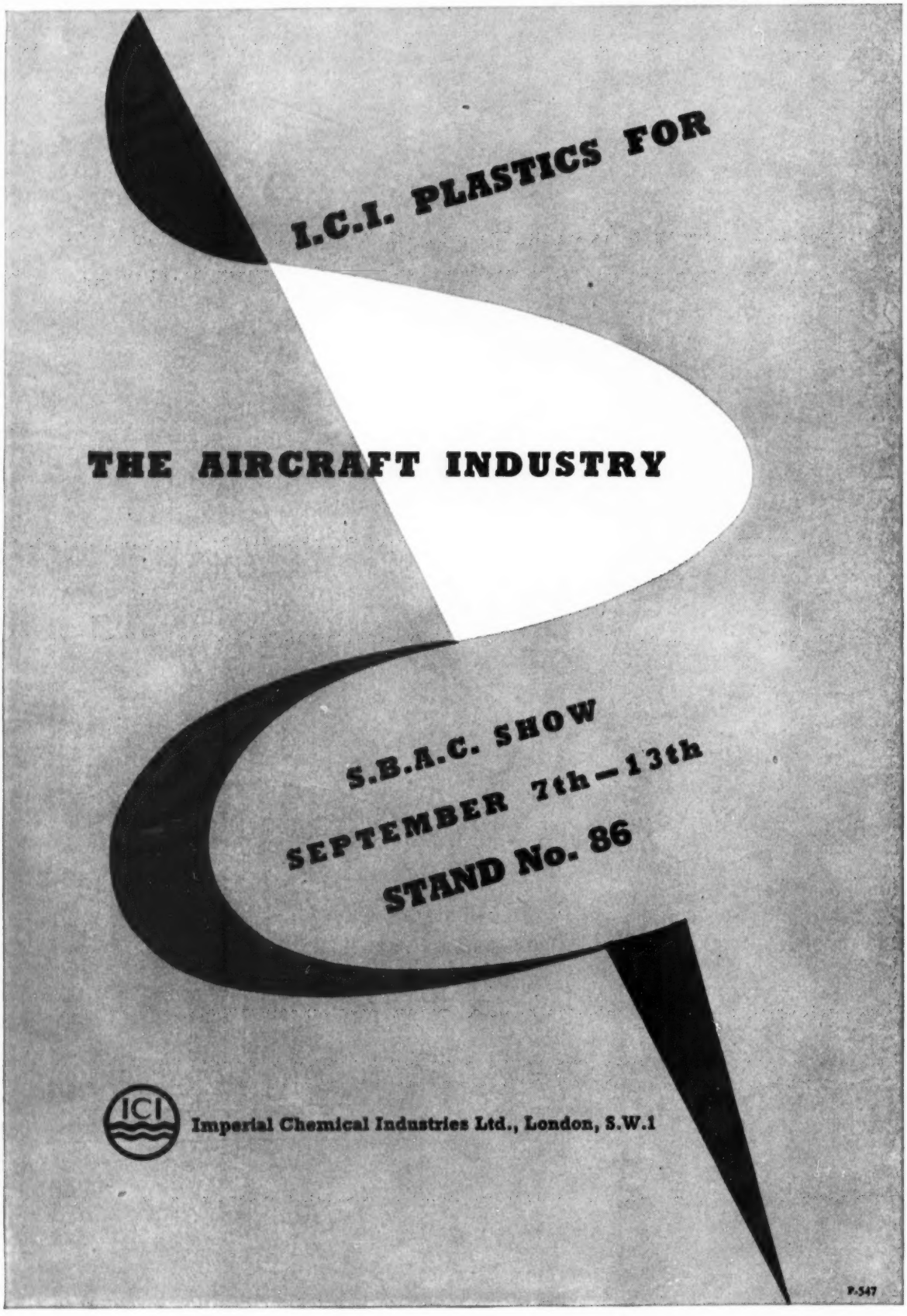
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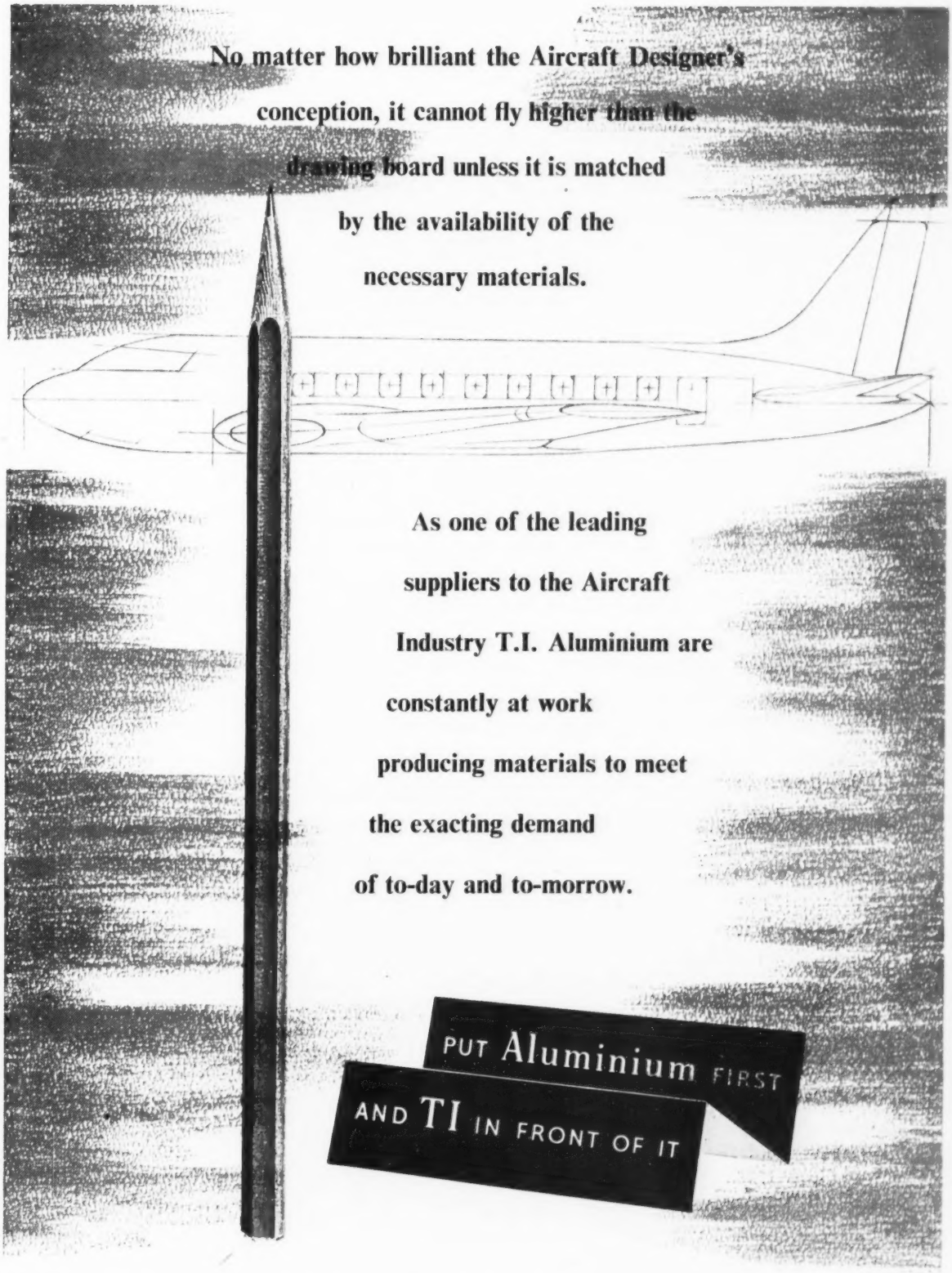
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Further information is contained in Publication No. 331.

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Further information is contained in Publication No. 285.

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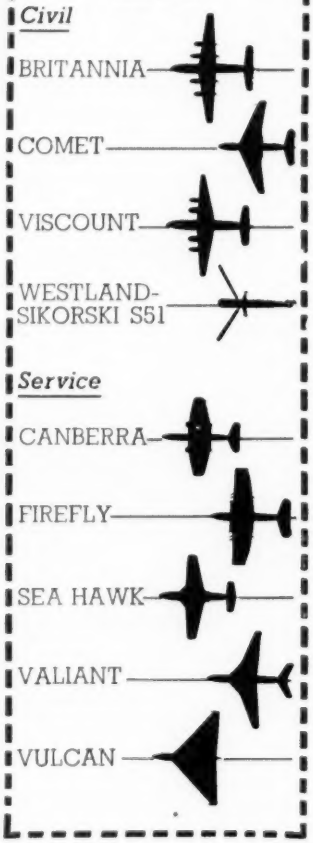
Further information is contained in Publication No. 319.

These are some of the more recent aircraft in which BICC Aircraft Wiring Cables have been used.



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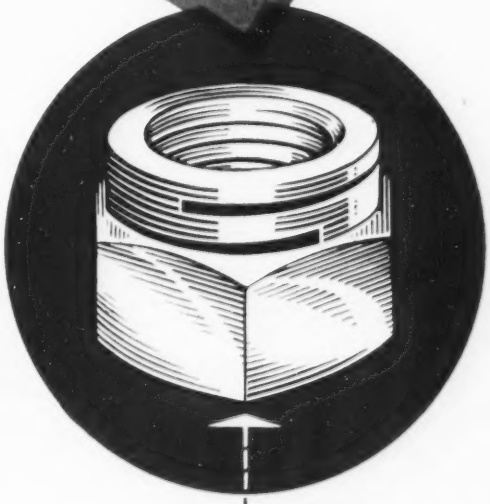

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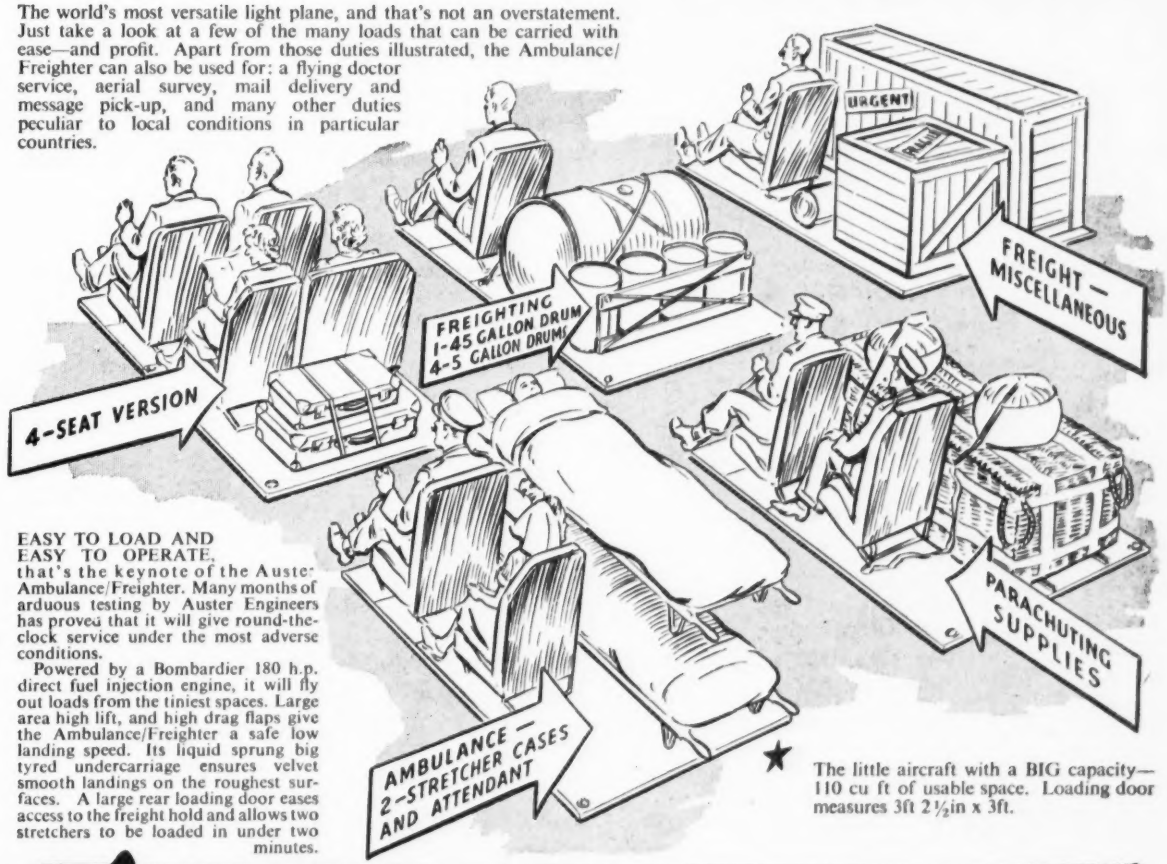

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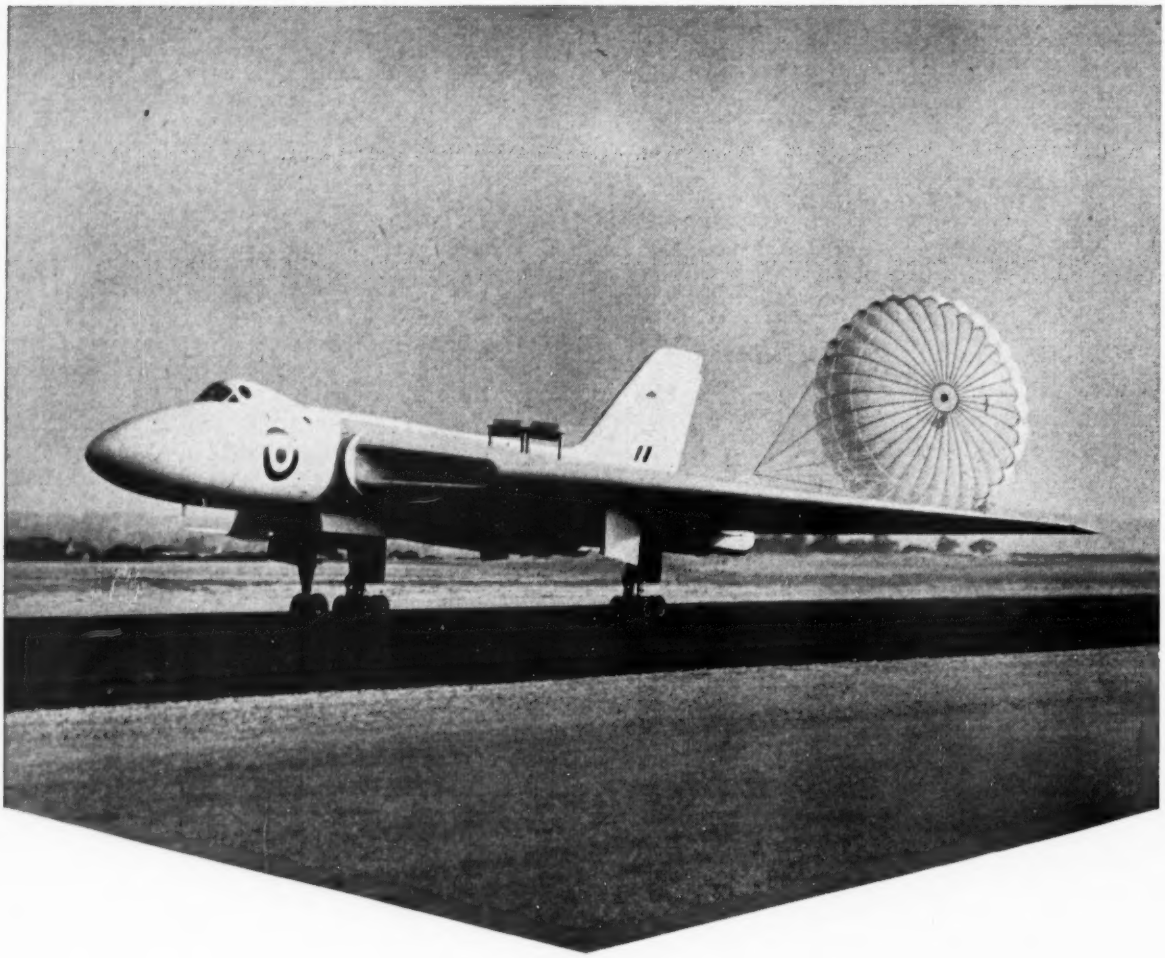

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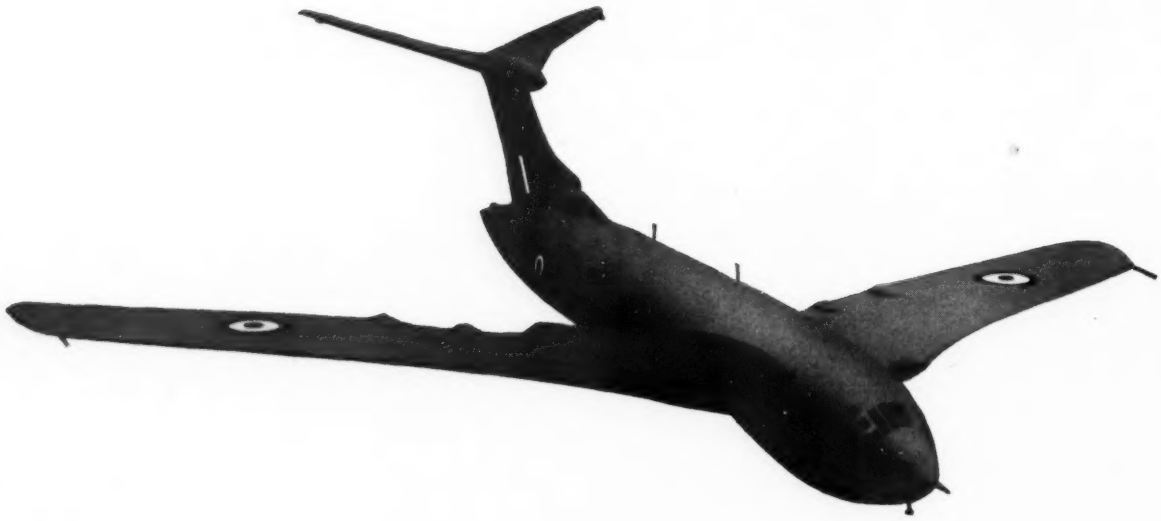

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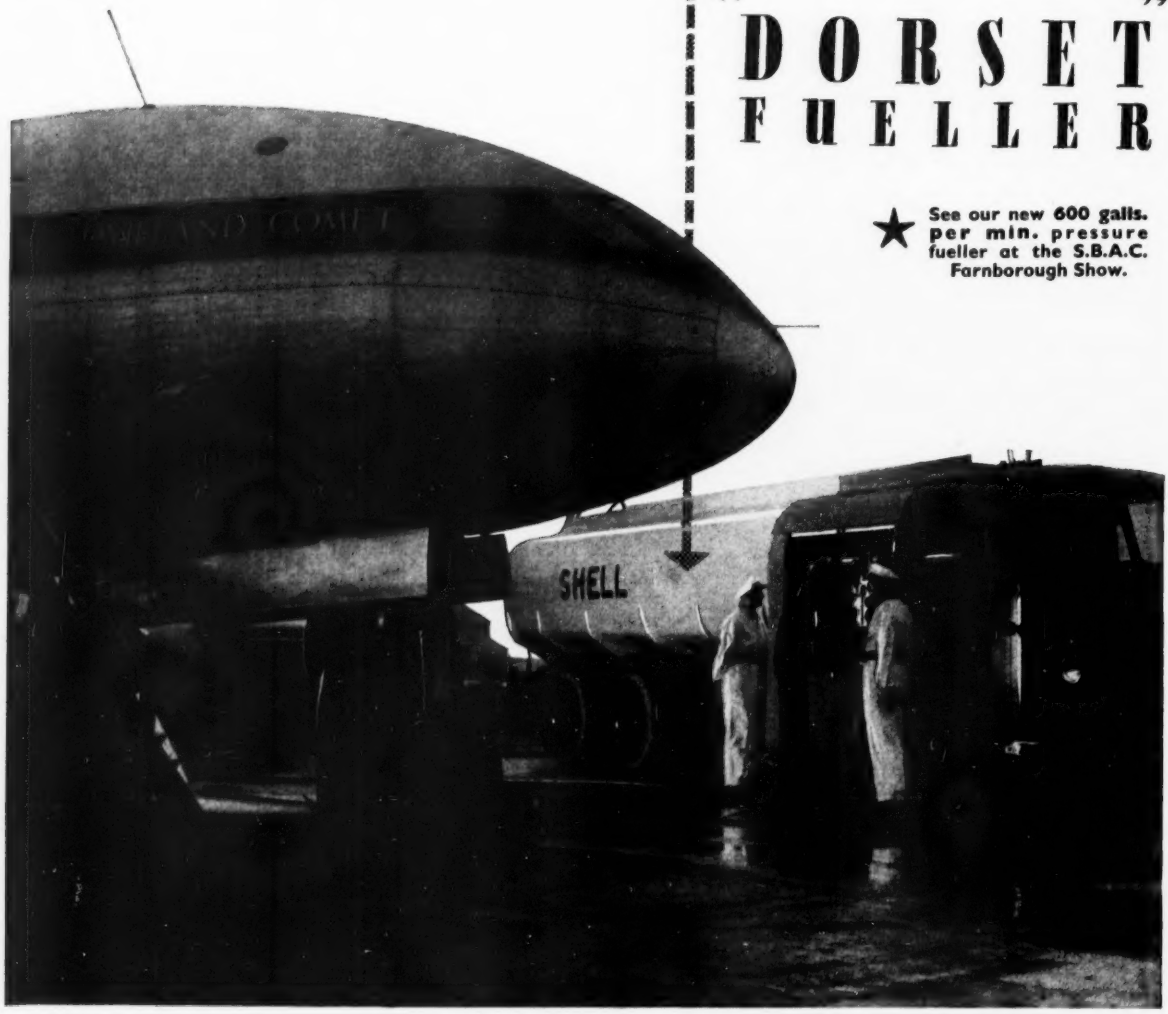

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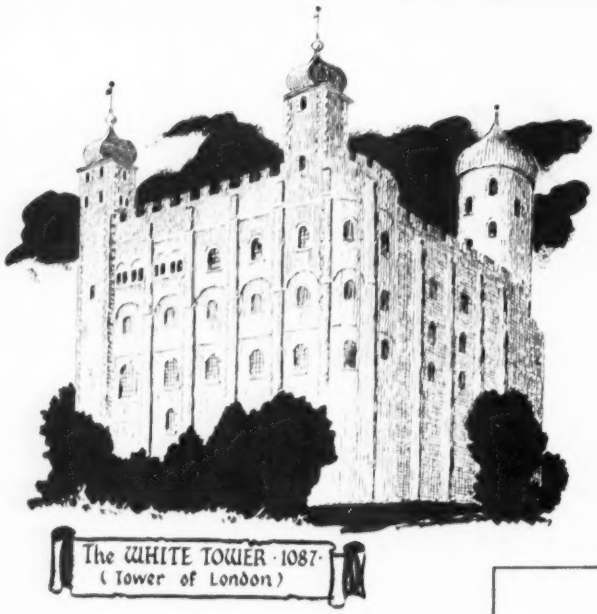

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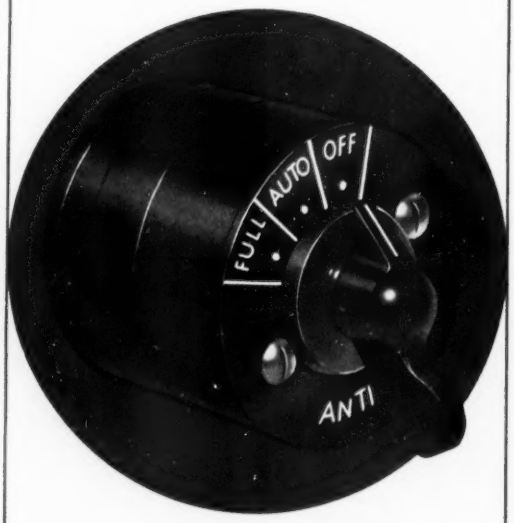

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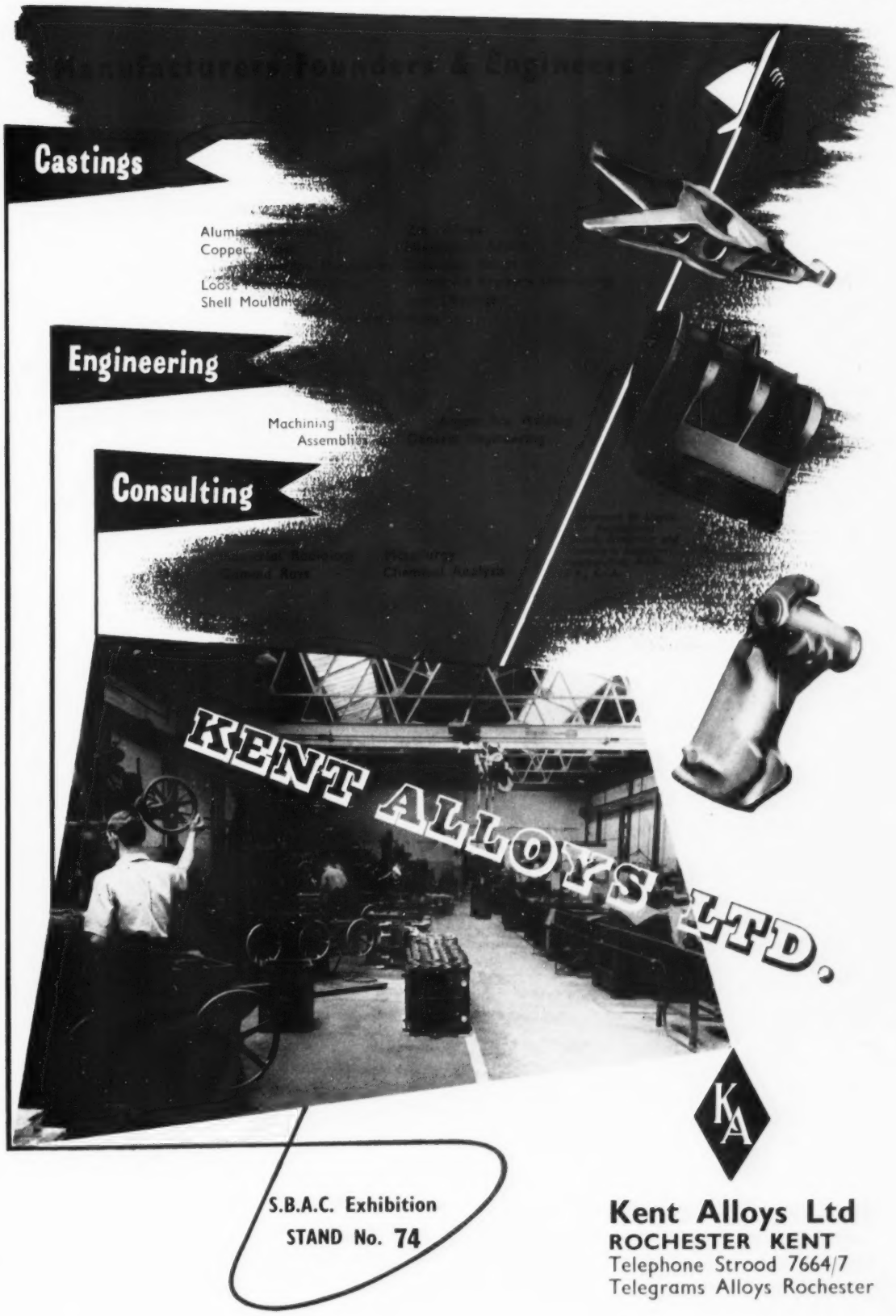

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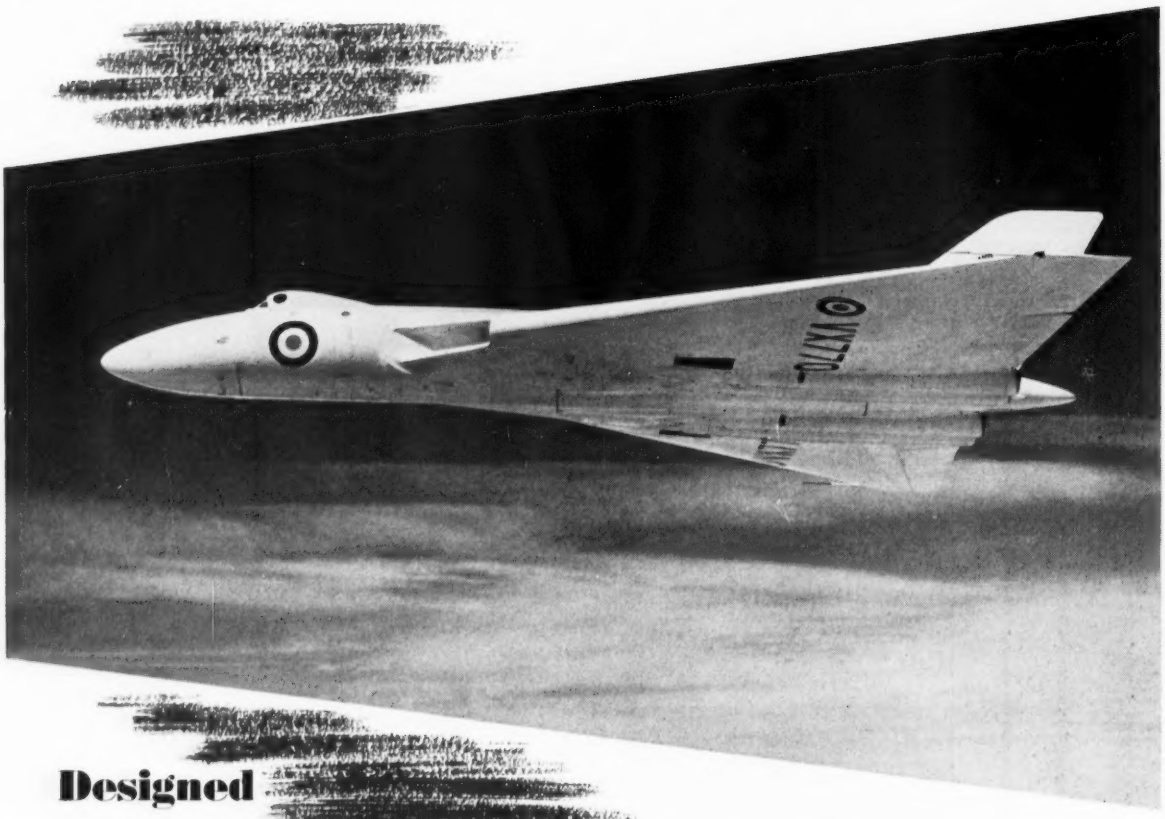

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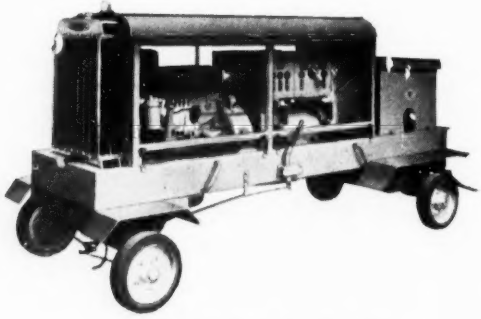

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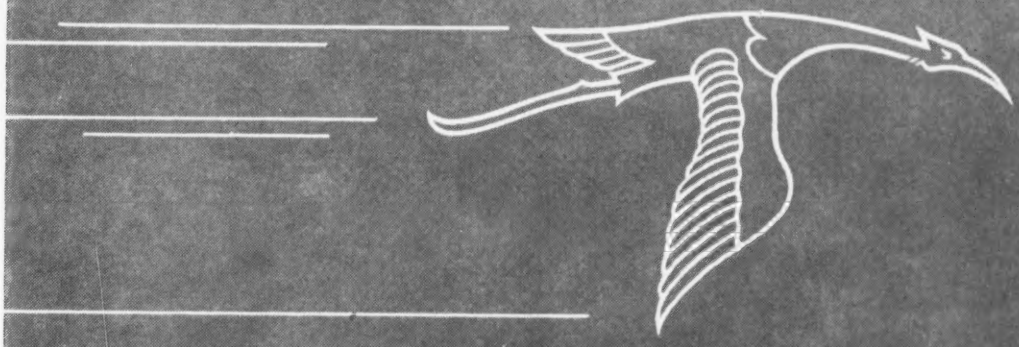

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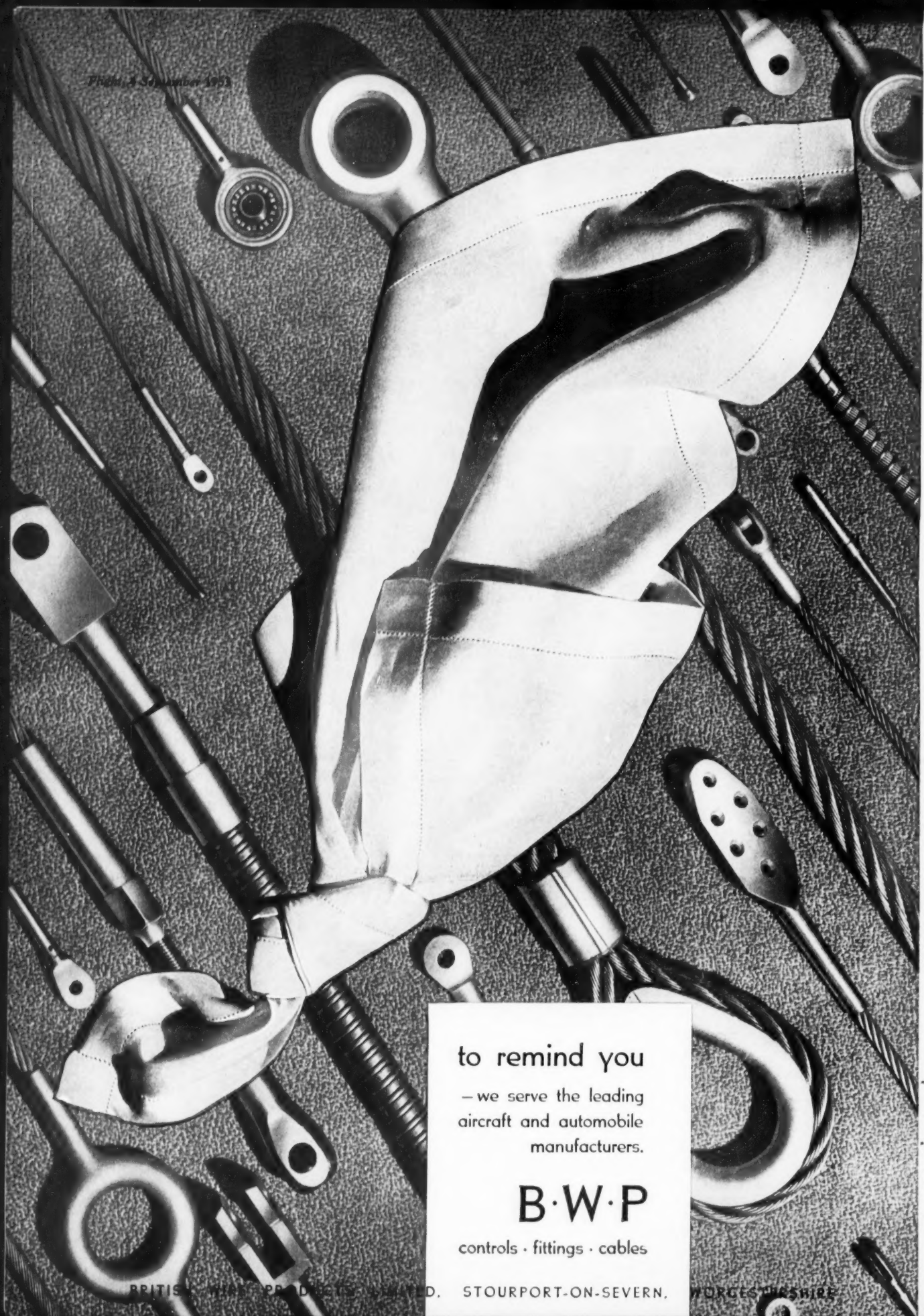

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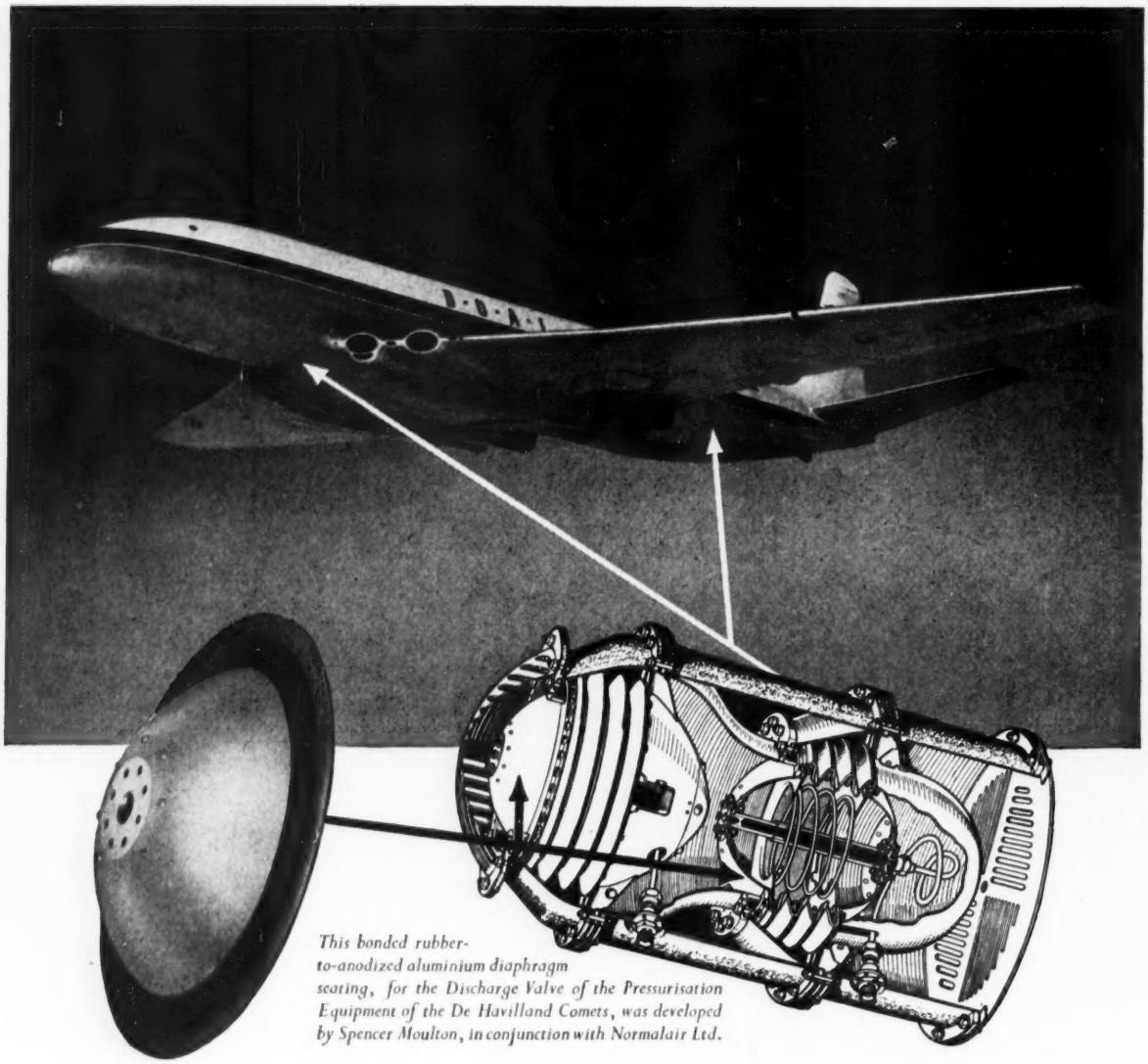

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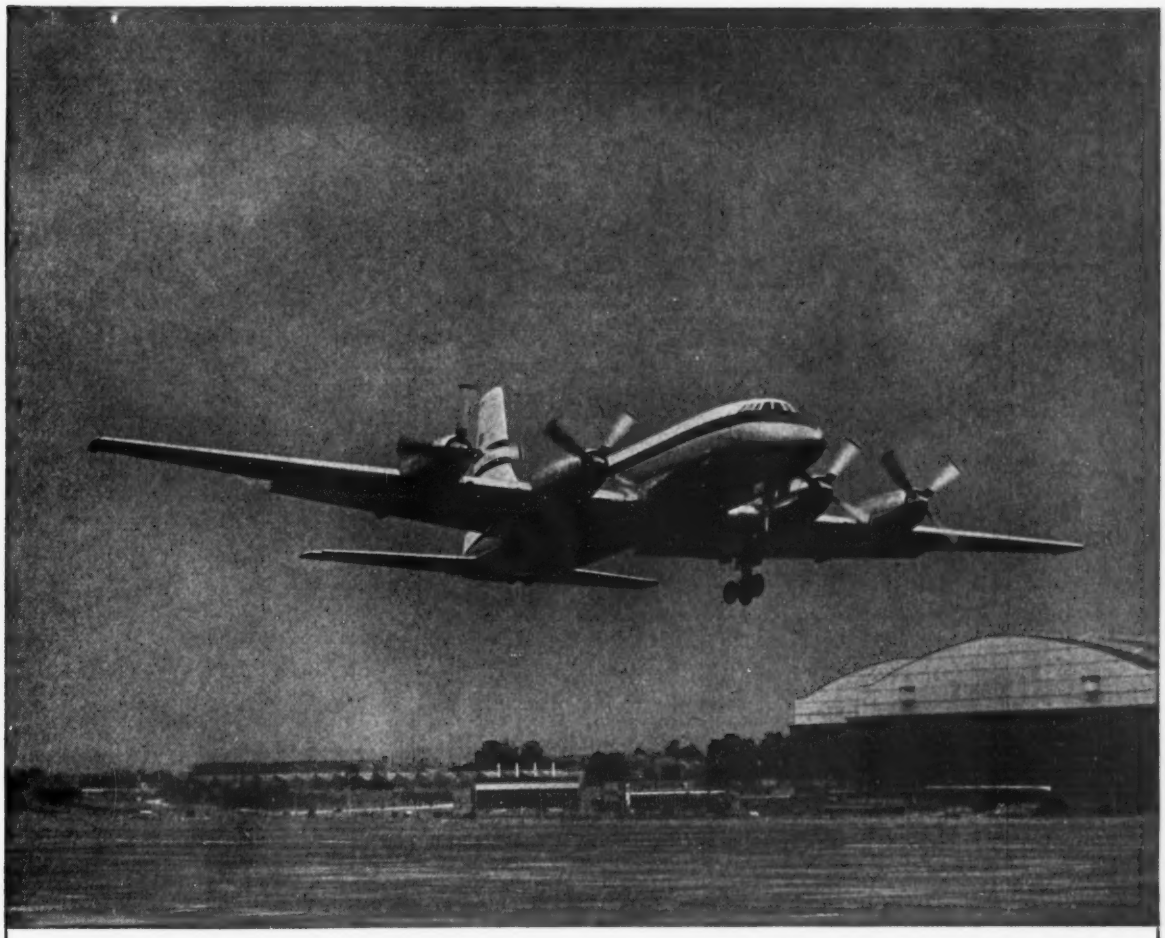

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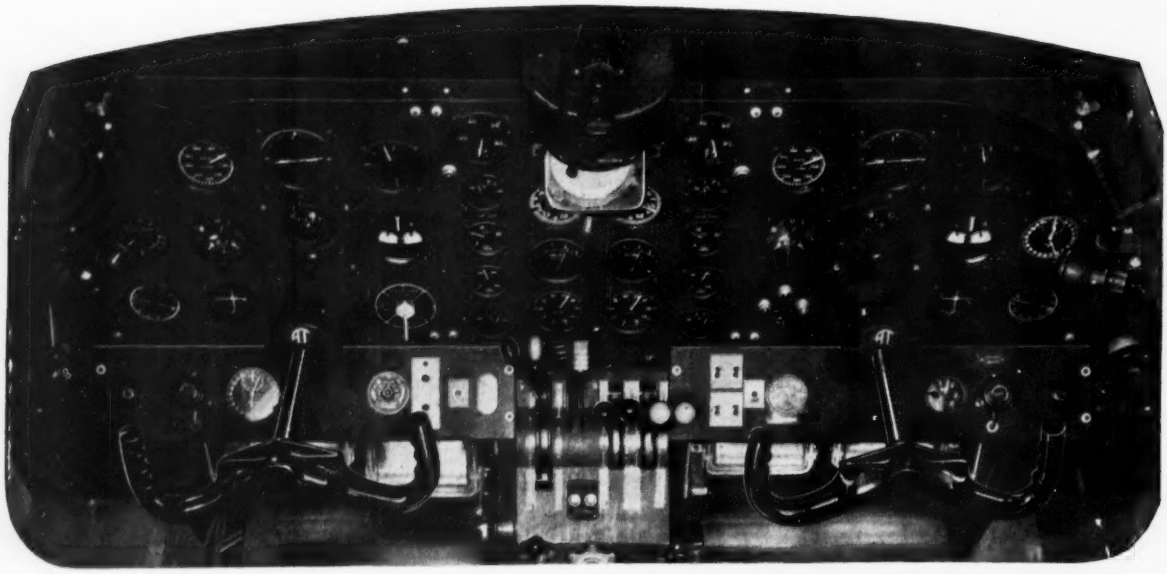

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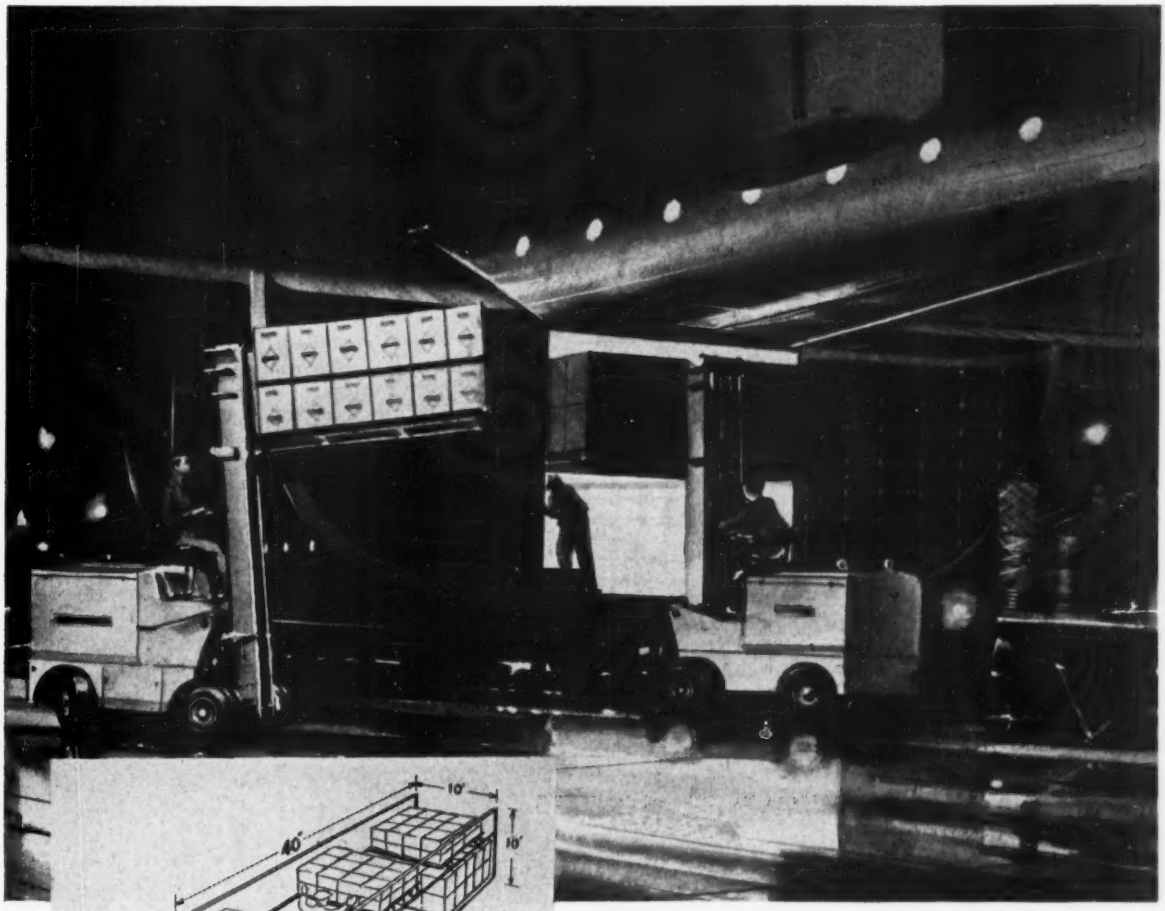

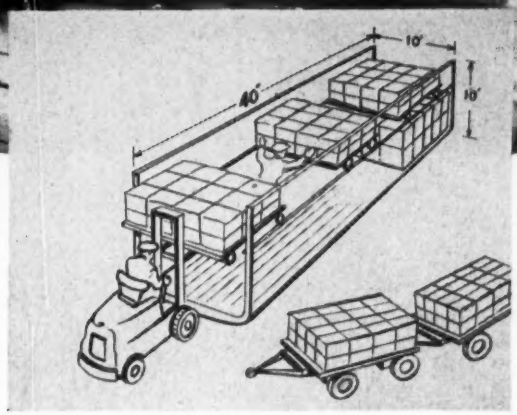

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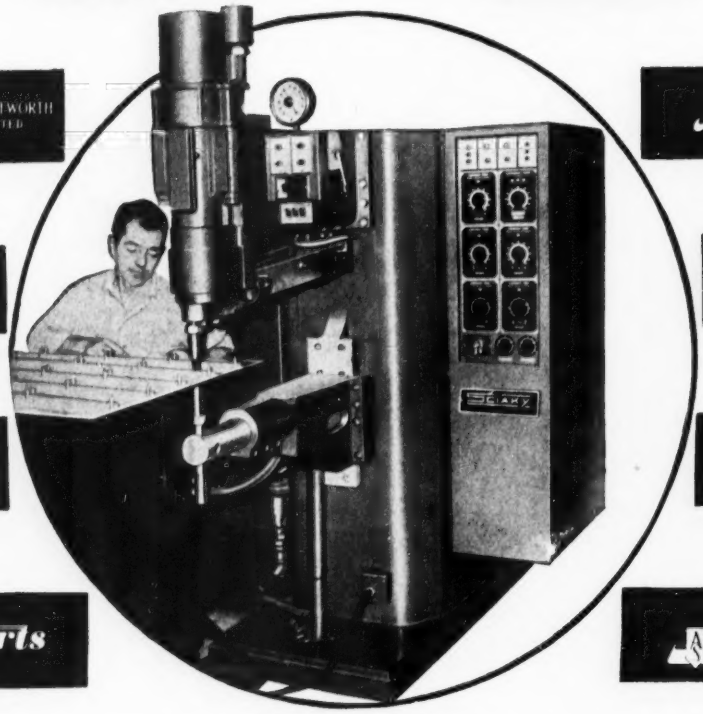

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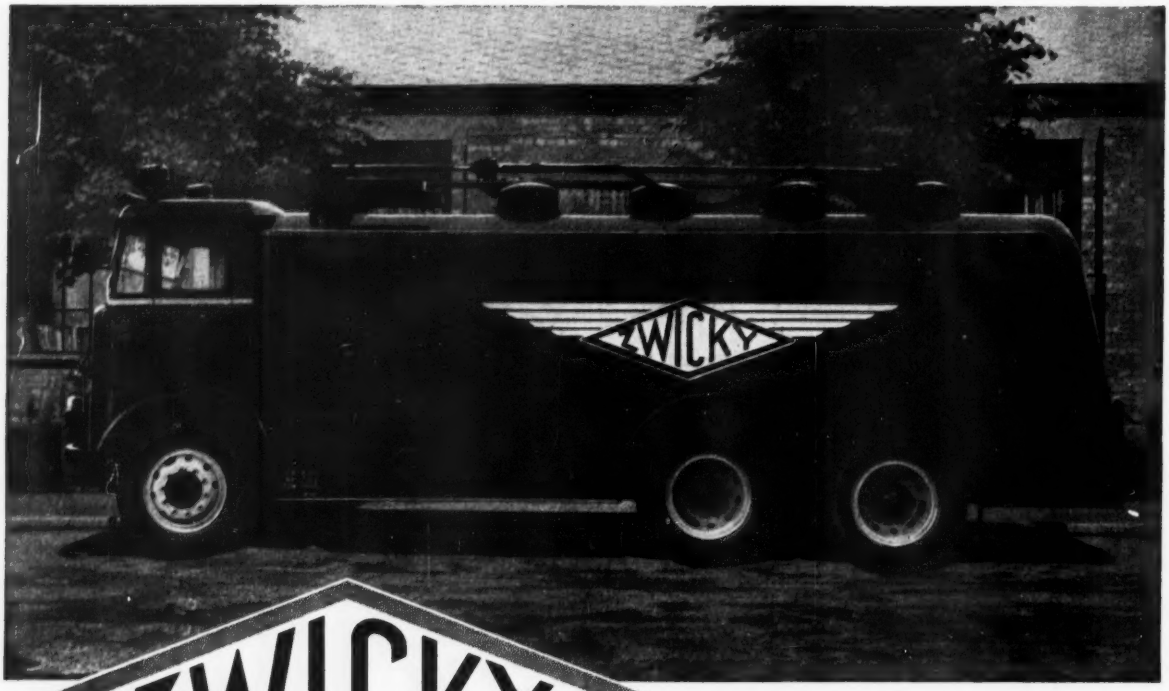

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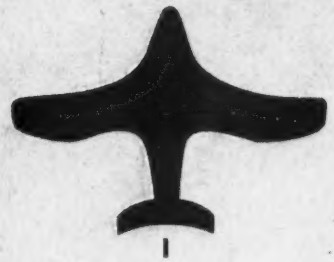

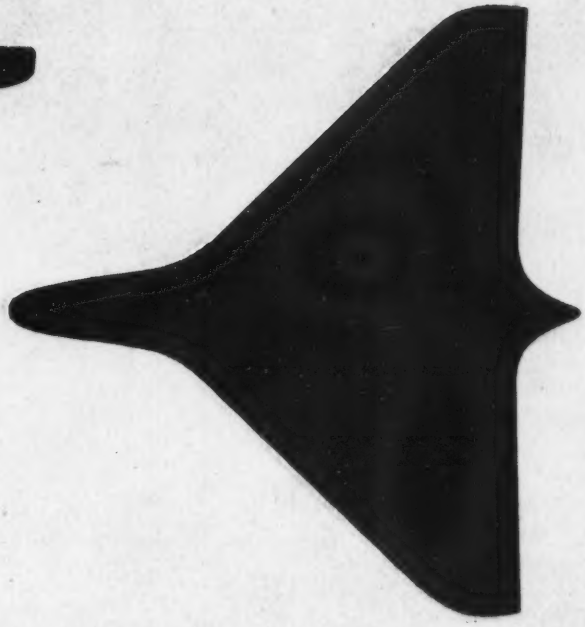

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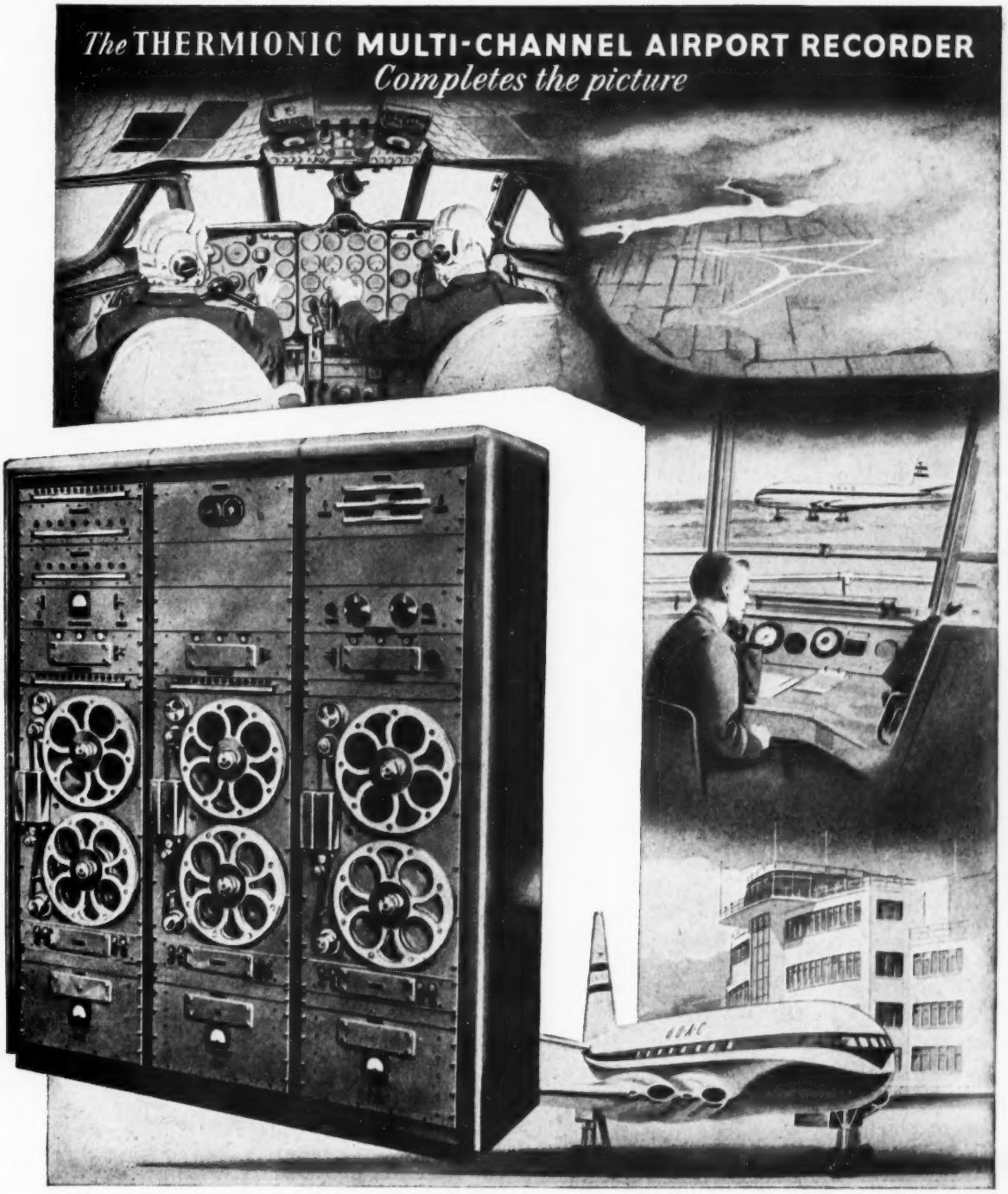

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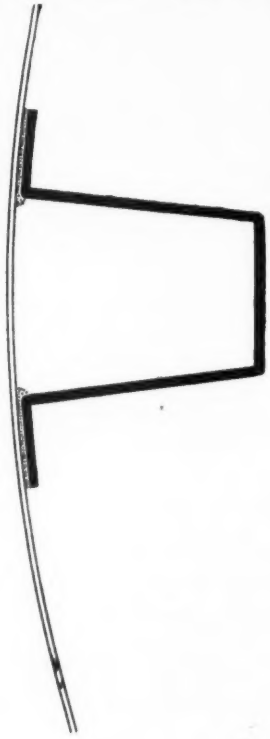

' Redux ' bonding is an easy, thoroughly practicable process developed by Aero Research Limited as the result of experience in designing and making aircraft.

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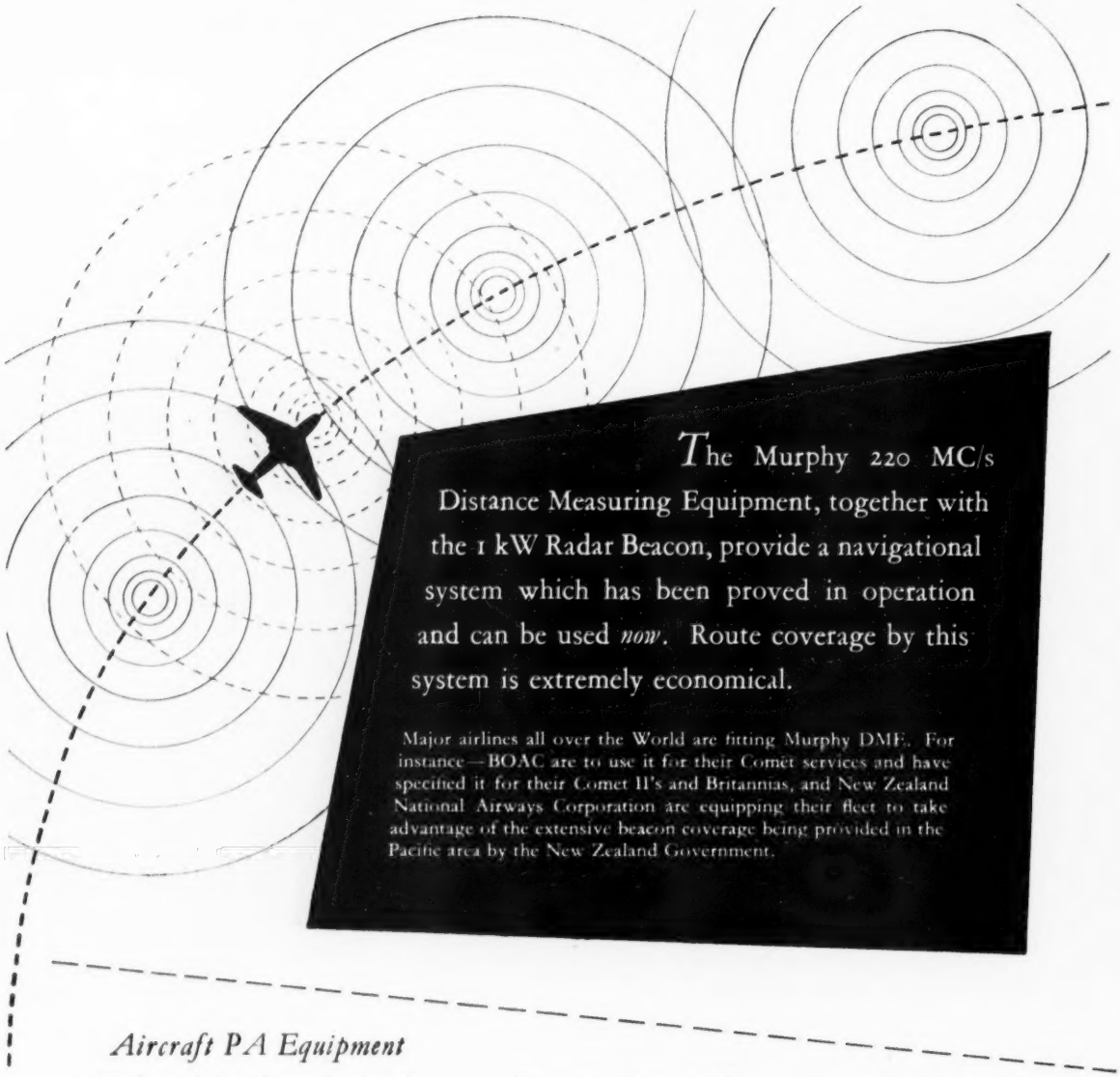

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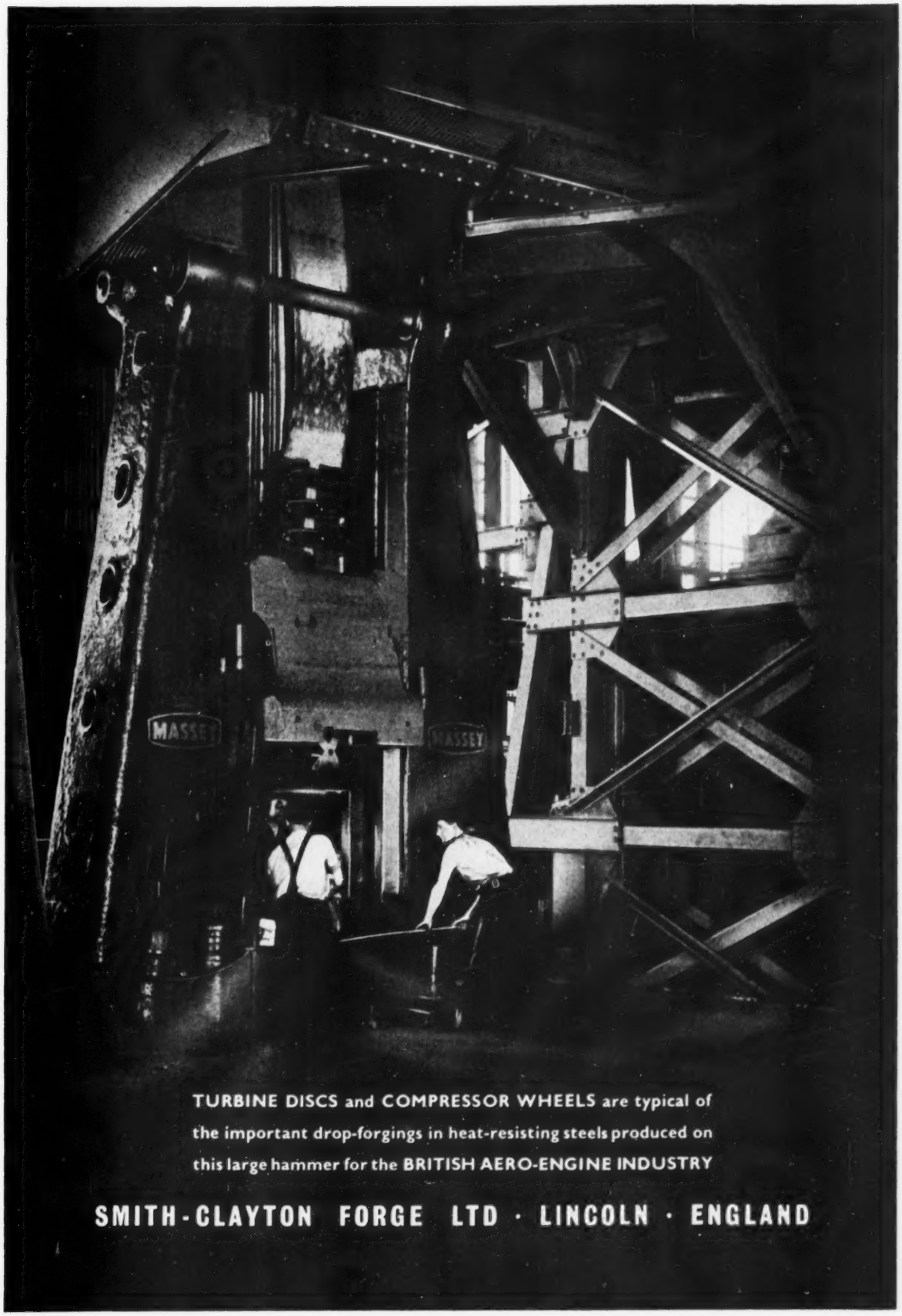

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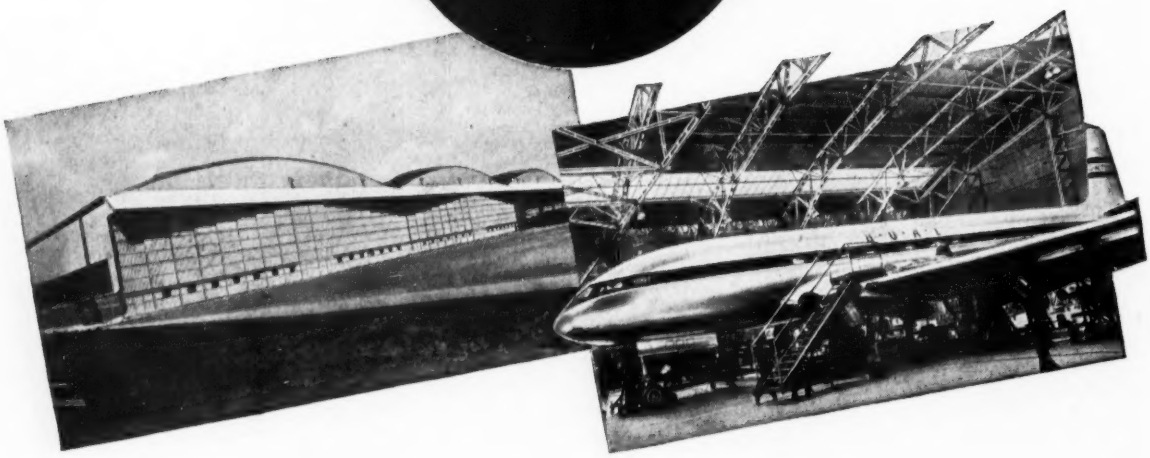

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Founded 1909

No. 2328 Vol. LXIV. FRIDAY, 4 SEPTEMBER 1953

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To Our Visitors

AT about this time of the year, with the harvest being gathered and autumn abundance in prospect, we Britons (or Britishers, if you prefer) like to contemplate the yield of our efforts. So it is in the flying business. From all branches of the Industry everyone who is able to do so makes his way to Farnborough, there to greet old friends and to interest new ones in Britain's latest aircraft. It is for the convenience of all Farnborough-goers at this time, and in the months ahead, that we have compiled this issue of *Flight*. Certainly a record for size, and also, we believe, for completeness, it sets out the salient characteristics of British aircraft, engines and proprietary equipment. A special directory lists the addresses of some 400 companies and briefly indicates the nature of their products. Thus, though we can hardly claim that the purchase of a Comet or a cotter pin is rendered equally easy, we do believe that the would-be customer, whatever his line, may be considerably helped by this compendium.

Aside from the commercial aspect of Farnborough, there is its appeal as a flying spectacle. It is an occasion to be enjoyed, and not merely endured for the sake of business; and it would be surprising, indeed, if Farnborough 1953 did not produce something well worth celebrating.

We wish you fair weather and a profitable visit.

A Nuestras Visitas

CUANDO llega esta temporada del año, con la cosecha recogida y lo abundancia de otoño a la vista, nos gusta contemplar el resultado de nuestros esfuerzos. Así le es en los negócios de aviación. De todo los ramos de la indústria él que pueda va a Farnborough paver saludar allí amigos viejos y paver interesar otros nuevos en lo más reciente de la aviación británica. Es para la conveniencia de todos los que vayen a Farnborough en este momento y para los próximos meses a venir, que hemos compilado el número presente de *Flight*. Es, por cierlo, un record por su tamaño y también, así lo creemos, por lo completo que es. Recalca las caracteristicas salientes de la aviación britanica, maquinarios y accesorios correspondientes. Un índice especial registra las direcciones de más de 400 compañias, e reseña brevemente la clase de sus productos. Aunque no podemos afirmar de que la compra de un Cometa sea igual de fácil como la de una bujía, creemos sinceramente que se ayuda considerablemente con este resumen a un probable cliente, sea lo que sea su negócio.

Aparte del aspecto comercial de Farnborough, hay questomas en cuenta su atracción como espectáculo de vuelo. Es una ocasión para divertirse, y no la de aguantarse nuevamente por causa de negócios. Así lo sería verdaderamente sorprendente si Farnborough del año 1953 no produzca algo que merezca la pena de celebrarlo.

Les deseamos buen tempo y una visita de provecho.

A Nos Visiteurs

EN cette saison de l'année, la saison des recoltes, les hommes veulent contempler les fruits de leurs efforts. C'est de même dans l'aviation. Dans chaque partie de l'industrie tous ceux qui trouvent l'occasion cherchent à se rendre à Farnborough, pour se réunir avec leurs compagnons, pour faire la connaissance de nouveaux collègues et pour présenter à ceux-ci les derniers accomplissements de l'industrie. C'est pour rendre service à tous ceux qui visitent Farnborough que nous présentons ce numéro de *Flight*, le plus grand et, nous le croyons, le plus complèt qui soit apparu jusqu'alors. Il vous offre un catalogue compréhensif de tous les avions, moteurs et équipment anglais. Vous y trouverez une liste spécialement conçue de plus de 400 compagnies, tout en indicant leurs produits. Par conséquence, bien qu'elle ne vous rendra pas également facile l'achat d'un Comet ou d'une clavette, nous croyons que le client éventuel, quoi que ce soit qu'il désire, en profitera grandement.

A part l'aspect commercial de Farnborough, il y a l'intérêt du pur spectacle aérien. Il ne s'agit pas d'une réunion purement pour affaires, mais aussi d'un spectacle impressionnant; et on doit bien prévoir pour Farnborough 1953 quelques développements tant mémorables qu'i nportants.

Nous vous souhaitons une visite satisfaisante et agréable.

FROM ALL QUARTERS

Going Hunting

THE news broke on August 26th that preparations were in hand on the south coast for an attempt on the world's air speed record by S/L. Neville Duke, flying a Hawker Hunter. Next day Royal Aero Club observers were standing by and a bright-red Hunter—a reheat-Avon prototype with a new, pointed nose—was seen hurtling over the now-familiar British record course between Kingston Gorse and Rustington.

During Monday, August 31st, Duke was out from Tangmere in a silver "second string" Hunter, and that evening made four timed runs in the red machine. He found things "a bit bumpy" and experienced a cross-wind. He felt he could do better and it was decided that he would try again early on the following morning. He was, apparently, prepared to sacrifice some advantage in speed—due to relatively low temperature—for smooth flying conditions, and the fact that a very high temperature was not considered essential suggests Hawker's confidence in the ability of the Hunter to surpass the standing record of 715.69 by the required 1 per cent. This means that Duke would have to average 722.847 m.p.h. on his four runs over the three-kilometre course.

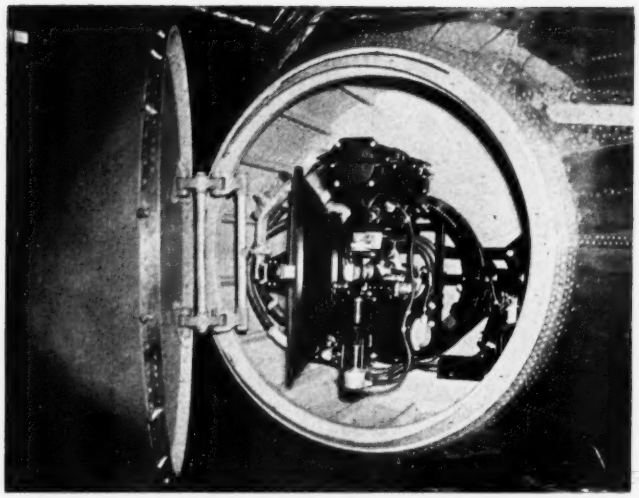
By 0806 on Tuesday the Hunter was again airborne; but soon it was learned with great disappointment that trouble with one undercarriage leg had caused Duke to make for Dunsfold, where he circled for half an hour using up fuel and trying to lock the offending leg into position. By ill-luck the leg folded on landing and the Hunter settled on one wing. As we go to press it is reported that damage is slight and that Duke himself is unhurt.

There are still strong hopes that—subject to the usual confirmation—the world's air speed record may be Duke's before the opening of Farnborough.

Napier Appointment

THE appointment of Mr. R. M. Hilary, M.B.E., T.D., as commercial manager of D. Napier and Son, Ltd.—a recently created post in the company—has been announced. Mr. Hilary was educated at Winchester College and King's College, Cambridge, and from 1935 to 1939 served with Imperial Airways in the Middle East, the Far East, and London. After service in the Army from 1939 to 1942, he was seconded to R.A.F. Transport Command, with the rank of lieutenant-colonel, for Air Staff Plans duties. On demobilization he returned to B.O.A.C. and in 1946 was seconded to Iraqi Airways, Baghdad, to assist in the formation of that airline. From 1947 to 1950, Mr. Hilary was manager for B.O.A.C.'s Middle East area, and in 1950 returned to the corporation's head office in London to become Secretary, Central Area (Africa and Middle East). Since then he has been assistant sales director of the corporation, with special responsibilities for planning.

Mr. R. M. Hilary.



PICTURE PAINTER: It has not previously been possible to illustrate the cloud/collision warning set installed in the nose of the R.C.A.F. Comet 1As. Here the scanning unit is seen, with the Fibreglass nosecap open; the equipment is of Ekco design and manufacture. For navigational purposes, the scanner can be tilted downwards to "see" the ground.

Employment Figures Rise

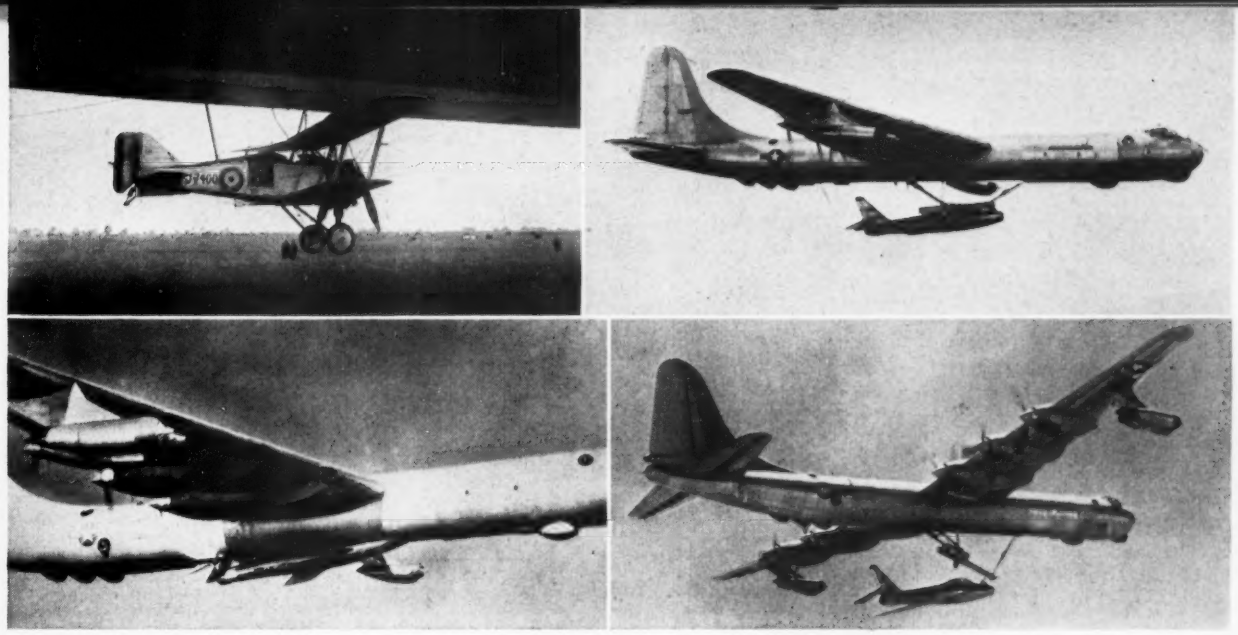
RECRUITMENT of workers into the aircraft industry continues to show improvement. Latest figures from official sources show that the employment figure at the end of May was 216,700, an increase of 23,100 over the total at the corresponding time last year. Details of the increases—and one small decrease—for two-and-a-half years are shown below.

Year	Males	Females	Total	Monthly Loss/Gain
1951				
January	134,100	23,000	157,100	+3,500
February	135,800	23,500	159,300	+2,200
March	137,000	23,600	160,600	+1,300
April	138,000	23,900	161,900	+1,300
May	137,240	24,350	161,590	− 310
June	138,800	24,600	163,400	+ 1810
July	139,600	24,700	164,300	+ 900
August	141,100	25,100	166,200	+1,900
September	143,600	25,900	169,500	+3,300
October	145,800	26,700	172,500	+3,000
November	147,300	27,000	174,300	+1,800
December	149,300	27,200	176,500	+2,200
1952				
January	151,500	27,900	179,400	+2,900
February	155,600	28,500	184,100	+4,700
March	157,700	28,800	186,500	+2,400
April	159,800	29,300	189,100	+2,600
May	163,870	29,730	193,600	+4,500
June	164,500	30,200	194,700	+1,100
July	165,400	30,300	195,700	+1,000
August	167,500	30,800	198,300	+2,600
September	169,300	31,000	200,300	+2,000
October	172,300	30,900	203,200	+2,900
November	173,900	30,900	203,800	+ 600
December	175,200	31,000	206,200	+2,400
1953				
January	177,000	31,300	208,400	+2,200
February	178,500	31,500	210,000	+1,600
March	180,700	31,700	212,400	+2,400
April	182,400	32,000	214,400	+2,000
May	184,400	32,300	216,700	+2,300

Air France Comets in Service

ON Wednesday, August 26th, Air France operated their first regular service with a jet airliner—Comet F-BGNY, which carried a full complement of passengers from Le Bourget to

L.A.P. SUBWAY: Now almost completed, the 2,026ft tunnel connecting the central terminal area at London Airport with the Bath Road will be opened in time for next month's London-New Zealand Race. Competing aircraft will be started from the central area, where the new buildings (left) are now taking shape.



HANGERS-ON: The recent disclosure that a specially modified Republic F-84F Thunderstreak of the U.S.A.F. has been successfully air-launched from, and retrieved by, a parent B-36 (as shown in the three consecutive views), is of more than passing interest. Tactically, the significance is that the Thunderstreak, which is known itself to possess a long range in addition to very high speed, could undertake vital bombing or reconnaissance missions over vastly extended distances. Historically, the news recalls earlier British experiments in the air-launching of fighters, among which were those made with Gloster Grebes from the airship R.33 during 1926 (see first "Flight" picture). In hooking-on the Thunderstreak first engages a nose catch.

Beirut *via* Rome. The new service, which returns to Paris on Thursdays, takes three hours less than the thrice-weekly Constellation service on the same route. On August 25th, F-BGNX (first of three Comet 1As delivered to Air France), while *en route* to Hatfield for minor modifications, operated an extra service on the Le Bourget/London route, carrying 26 passengers. The time from take-off to touch-down was 51 minutes, giving a block speed of 253 m.p.h. Appropriately enough, August 25th was the 34th anniversary of the first regular London-Paris flight—by a D.H. 4a, which made the trip in 150 min.

Air France take some pride in being the only airline to operate both Comets and Viscounts (which, incidentally, were due to make their debut on September 2nd on the Paris-Milan-Rome route). There is a strong possibility that either or both of these British turbine-powered airliners will appear at Farnborough in the colours of Air France.

Ferrying and Freighting

SUPERFREIGHTERS of Silver City Airways made 1,840 Channel crossings during the period of the French strike (August 6th-22nd). Some 21,000 passengers, many of them stranded tourists, were carried, in addition to 3,300 cars, 1,800 motor cycles and 1,400 pedal cycles. On Sunday one of these aircraft carried from Lympne to Zurich the first cars exported to Switzerland by air—two Morris Minors and a Wolseley 4/44.

Comet at Zurich

A HIGHLIGHT of the official opening of the new terminal building at Zurich (Kloten) Airport was the first arrival of a Comet. Sir Miles Thomas was among the passengers aboard the aircraft—G-ALYT, the Avon-powered Series 2 prototype—which set up an unofficial record on the return journey by covering the 489 miles at 376 m.p.h. "without trying." The newly opened *Flughof* (air station) was built recently at a cost of nearly £1m, and is part of a £9m scheme for this fine airport.

Holland's New C.A.S.

IN succession to Lt. Gen. I. A. Aler, Gen. Maj. A. Barretta has been appointed Chief of the Air Staff of the Royal Netherlands Air Force. General Barretta, who was born in 1897, transferred to the Aviation Division from the Dutch Artillery in 1920. In 1925 he returned to the Artillery, becoming a captain on the General Staff in 1934, and in 1939 he joined the Air Defence Command, but was held prisoner by the Germans until 1945. In 1946 he took a course with the Royal Air Force and has since held Air Staff appointments, including that of Deputy Chief of Air Staff under Gen. Aler.

Gen. Aler, who is 56, is retiring on October 1st. Due to retire last year, he had retained his post for a further year at the request of the Dutch Minister of War. Gen. Aler served for ten years in the Dutch East Indies.

Nationalizing "Unwise"—T.U.C.

THAT it would be unwise for the trade-union movement to commit itself at this stage to any specific measures for public ownership or further measures of public control in the aircraft industry is one of the conclusions reached by the General Council of the T.U.C. in an interim report published this week on the subject of *Public Ownership*.

Adopting a more knowledgeable approach than did the Labour Party in their recent policy statement *Challenge to Britain*, the T.U.C. acknowledge that the problem of the aircraft industry is one on which it would be foolish to dogmatize. They state that two main lines of thought are at present current in the Labour movement as regards public control of the industry. The first is exemplified by the argument in favour of public ownership put forward by the Confederation of Shipbuilding and Engineering Unions; summarized, this is a declaration that an industry heavily subsidized by public money should be under close public control, and that such control is best obtained by public ownership. The other approach, according to the T.U.C., is not incompatible with this argument, but lays the emphasis on the economic tasks of the industry and considers whether public ownership or control can aid the achievement of these tasks.

This latter approach accords best, in the T.U.C's view, with the spirit of their report—which stresses the value of the empirical outlook—although both lines of argument raise important issues which require further examination. The report continues as follows:

"It is beyond dispute that the industry is largely dependent upon public authorities for its well-being. The R.A.F. and the Air Corporations are its chief customers, the Ministry of Supply subsidizes development work, and a great deal of basic research is done in Government establishments. The industry has been speculative in the past, but in recent years the financial risks of development have been carried to a large extent by public funds. This situation is likely to continue and the justification for a high return to investors (including capital appreciation) is thereby lessened.

"It can, however, be argued that the present combination of public and private finance and research has yielded very good results and should not be upset without compelling reasons. In this light the profits made by the firms are in the nature of an agency fee for managerial skills, and are also a price worth paying for the continued smooth running of the industry. The industry has a nucleus of only a few firms and most of these have been built up and are still controlled by highly individualistic designers.

"This background, and the psychology of these men, has to be taken into account when changes are proposed for the industry; our present lead in aircraft designs rests upon the work of a comparatively small number of design teams, and although they cannot be said to work merely for private profit they may none the less have strong prejudices against public ownership. With the qualification mentioned later, control over the industry already operates effectively through the relations between various public authorities and the private firms. Moreover, the record of the State-owned firm of Short Bros. does not indicate that any great advantage in this respect is likely to result from public ownership."

The report then outlines the qualification, which is to the effect that there is a perennial problem in the aircraft industry as

RUSSIAN COUSINS of the S-55 are these new-type helicopters shown at the Tushino Display. (See news item below).

FROM ALL QUARTERS . . .

regards the balance between quality and quantity. It continues:

"The British industry being run by designers it is sometimes alleged that the production side is neglected with consequent delay in putting prototypes in operation. During the last war, when it was hard to maintain a proper balance between the desire of the R.A.F. and designers for improved aircraft, and the need to produce large numbers of planes, it was found that some firms with experience of large-scale production outside the aircraft industry were able to organize aircraft production with fewer delays than some firms wholly concerned with aircraft. This experience seems to have been repeated since the war with the English Electric Canberra jet bomber."

The report concludes that whether such considerations weigh more heavily in the balance for public ownership than the disturbance in the industry that the latter might cause is a matter of very serious thought. It adds that while commitment to specific measures of public ownership would be unwise, a more detailed analysis of the problems involved must be made in conjunction with the Confederation before final conclusions are reached.

Sabena's Helicopter Passenger Services

ON Tuesday last, September 1st, Sabena inaugurated their inter-city helicopter passenger services on several of the routes over which they have been successfully operating mail flights for many months past, using Bell 47Ds and Sikorsky S-55s. The passenger routes are Brussels-Lille (twice daily in each direction), Brussels-Antwerp-Rotterdam (three times daily each way) and Brussels-Liège-Maastricht-Brussels (once daily). For these services the S-55s are being employed, and the Liège service is soon to be extended to Cologne and Bonn. Early next year it is planned to open yet another route, to Luxembourg and Saarbrucken.

A feature of the services is the use of heliports, with small but well-designed passenger buildings, at or near the centres of most of the cities served. *Flight* was invited to sample one of the services, shortly before the public opening, and some impressions of the journey will be given in next week's issue.

INTER-CITY 'BUS: One of Sabena's S-55s is refuelled—from a hydrant, via a mobile pump—on the Rotterdam Heliport. In the background is the City Hall. (See "Sabena's Helicopter Passenger Services," above.)

"Flight" photograph

Moscow's Big Fly-Past

THE air display and fly-past which were postponed from the Soviet Air Force Day on August 9th took place at Tushino Airfield, Moscow, on Sunday last. A commentary on the flying was broadcast over the entire Soviet radio network, hundreds of thousands of the public were reported to have attended, and members of the Russian Government (including Mr. Malenkov) watched the fly-pasts.

A large group of Yak-12s appeared first, the leader towing a red flag on which were pictures of Lenin and Stalin. They were followed by two aircraft towing the banners of the Soviet Air Force, and then in turn by 16 machines carrying the flags of the constituent Soviet republics. After a short interval, a formation of 75 Yak-18s passed over, outlining the words "Glory to the U.S.S.R." The leader of these formations was stated to be Lt. Gen. of the Air Force Kamanin.

After a group of aircraft flown by women pilots, and led by the wartime pilot Marina Techneva, came a formation of towed A-9 type gliders (designed by Antonov) and next 24 Yak-18 two-seat trainers.

The second part of the display, commanded by Lt. Gen. of the Air Force S. U. Rubanov, was opened by formation aerobatics (including the "Nesterov loop") by Mikoyan jet fighters. Ilyushin jet bombers, and jet fighters of unidentified type, followed. Col. Gen. Gorbatov was in charge of the third section of the display, which consisted of a demonstration by "new helicopters, designed by the brilliant young designer Mil," and a massed parachute landing by some 200 men from Il-12 machines.

Western observers, while impressed by the skill and precision of the Soviet flying, stated that the types of aircraft appeared to be unchanged since last year's display, but the number of military jet aircraft participating had increased from 182 to 424.

The Polish Air Force, now completely under Soviet control, celebrated its Air Force Day on August 23rd also. In a special order of the day, Marshal Konstanty Rokossowski, the former Soviet Army general who now heads all the Polish armed forces and holds the office of Minister of National Defence, urged all Air Force personnel to emulate the Soviet Air Force and to obey the party.

1953 Air Race Championship Result

FINAL placings of the majority of competitors in this year's British Air Racing Championship, organized by the Royal Aero Club, are shown in the table below. Those omitted—with six points or fewer—had all entered for one event only, out of the seven qualifying races. Those included have flown in at least two races, or have as many points as the lowest two-race pilot.

The points awarded to winners in the respective races are printed in heavy type: in the National Air Races, Robertson won the Grosvenor Cup, Bowles the Norton-Griffiths Trophy, and A. S. K. Paine the Kemsley Trophy. Last year's winner was Pat Fillingham, who achieved sixth position this year. Points towards the championship are based on the pilot's placing in conjunction with the number of starters in a given race.

Abbreviations in the column headings below denote: G.T., Goodyear Trophy (May 16th); W.A.D., Welsh Air Derby (May 30th); N.A.R., National Air Races (June 20th); K.C., King's Cup Race (June 20th); S.T., Siddeley Trophy (August 22nd).

Place	Competitor	Points Awarded					
		G.T.	W.A.D.	N.A.R.	K.C.	S.T.	Total
1	J. Rush	16	11	15	11	9	62
2	G. R. I. Parker ...	20	13	6	—	13	52
3	W. P. Bowles ...	9	6	**17**	15	—	47
,,	R. R. Paine	**22**	5	13	7	—	47
5	A. S. K. Paine ...	11	—	**17**	3	15	46
6	W. P. I. Fillingham	7	2	15	**17**	—	41
7	J. N. Somers ...	3	15	4	—	**17**	39
8	F. Dunkerley ...	8	—	11	9	5	33
9	D. J. Bennett ...	14	—	11	5	—	30
,,	D. R. Robertson ...	—	—	**17**	13	—	30
11	P. Hillwood	12	9	—	—	7	28
12	A. J. Spiller	10	3	4	—	3	20
13	C. Gregory	—	—	15	4	—	19
,,	Prince Alexander ...	—	—	13	6	—	19
15	S. A. Holloway ...	—	**17**	—	—	—	17
16	D. C. Jemmett ...	5	2	9	—	—	16
17	N. F. Duke	—	—	11	2	—	13
,,	A. Bough	2	—	—	—	11	13
,,	D. F. Ogilvy ...	—	—	13	—	—	13
20	G. Marler	4	—	6	—	—	10
21	F. Murphy	—	—	9	—	—	9
	M. R. T. Chandler ...	—	—	7	—	—	7
	C. M. M. Grece ...	2	—	5	—	—	7
22	D. M. Spencer-Smith	—	—	7	—	—	7
	R. H. McIntosh ...	—	—	7	—	—	7
	H. J. G. Turner ...	—	4	3	—	—	7

SUPPLIES-LIFT: For the third year in succession, R.A.F. Sunderlands are assisting the British North Greenland Expedition. In this photograph, one of the five aircraft of No. 201 Squadron assigned for the duty is seen on the tricky approach to Young Sound, jumping-off point for Britannia Lake, 190 miles distant, where the expedition's main camp is situated.

HERE AND THERE

Conway Development

THE existence may now be disclosed of a version of the Rolls-Royce Conway by-pass turbojet, designated RCo.3. Reference to the earlier RCo.2 was made for the first time in October last year.

Canada's Missile

A "WORKING MODEL" of an air-to-air guided missile was launched from a Sabre near Ottawa on August 27th. Anti-bomber weapons of this type are being developed for the Royal Canadian Air Force.

Canberra P.R.7

THIS designation for a new photographic reconnaissance version of the English Electric Canberra has recently been made known. The power plants are two Rolls-Royce Avons of unspecified mark. No reference to any Mk 6 version of the Canberra which may be forthcoming is yet allowed.

Perth-Melbourne by Canberra

THE 1,640 miles from Perth to Melbourne were covered in the record time of 2 hr 37 min by two R.A.A.F. Canberras on Sunday last. Assisted for part of the time by winds of over 120 m.p.h., the aircraft flew at 40,000ft and averaged 628 m.p.h. One of the machines was the first Australian-built Canberra, and the other was British-built.

On The Level

THE United Aircraft Corporation announced in New York recently that it had developed a turbojet (presumably the Pratt and Whitney J57) which had "repeatedly driven a fighter plane faster than the speed of sound in level flight." The aircraft is supposedly the North American F-100, an enlarged development of the Sabre.

London-Belfast by Dunkerley

YET another light-aircraft city-to-city record in class C-1-c (1,000 to 1,750 kg a.u.w.) has been obtained by Mr. Fred Dunkerley, subject to confirmation. It is from London to Belfast, and was obtained on August 25th. In his Miles Gemini 1A (Cirrus Minor 2s) he took 2 hr 4 min 54 sec for the flight from Croydon to Nutts Corner Airport, Belfast, average speed being 154.5 m.p.h. On the return trip, engine trouble was experienced over the Irish Sea, and a single-engined landing made at Speke Airport, Liverpool.

New Skyrocket Record

IT was announced in Washington on Monday that Lt.-Col. M. Carl, U.S. Marine Corps, had attained 83,235ft (3,741ft higher than Bill Bridgeman's 1951 record) in a Douglas Skyrocket launched from a Superfortress at 34,000ft.

Vintage Weather Again

BAD weather caused the cancellation of the Vintage Aeroplane Club's rally on Saturday last, August 29th. The low cloud-base and driving rain forced even the Patrouille d'Etampes to stay on the ground, and members and guests remained clubhouse-bound for the afternoon. David Ogilvy, secretary of the club, stated that it would be impossible to hold the function this season, but that they would try again early next year.

Dutch Hunters

IT is reported that a total of 460 Hawker Hunters are to be built under licence in Holland by the Fokker, De Schelde and Aviolanda factories. Of these, 112 are "off-shore" for America, and they will be allocated to the European air force which may need them most. Of the remainder, 156 are for the Dutch Air Force and 192 for the Belgian Air Force. Under the terms of the licence agreement all Hunter modifications will be notified to the Dutch industry without delay. The turbojets and undercarriages will be built in Belgium. It is also reported that the first five Grumman Avengers for the Dutch Naval Air Force arrived in Holland recently on the freighter *North West Victory*.

Stansted Display

A VARIED programme has been arranged for the second annual Air Display of the Stansted Branch of the R.A.F.A., to take place on September 26th at Stansted Airport, near Bishop's Stortford, Essex. The flying programme includes items by the Meteors of 601 Squadron, an individual Meteor from C.F.S. and the Cambridge Reserve Centre Chipmunks, while participation by the Canadian Sabres from North Luffenham and the U.S.A.F. has also been arranged. The airport will be open at noon, with flying at 2 p.m.; in the evening there will be a dance.

THE STORY OF FARNBOROUGH

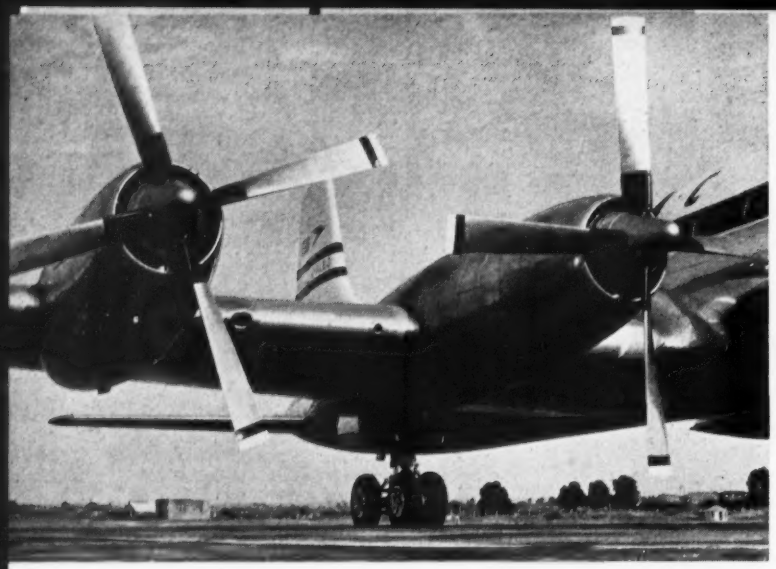
"Flight" next week (September 11th)—the Farnborough Report Number—will contain first-hand descriptions, specially illustrated, of the flying and the new aircraft seen at the opening days of the Show; these will be in addition to articles on other topics, and to regular features.

"Flight" for September 18th—the Farnborough Review Number—will offer a detailed appraisal of the week's flying and a further description of the static exhibits together with regular features and articles on other subjects.

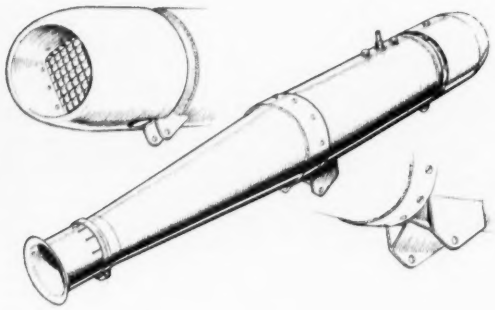
Both issues will be priced at 1s.

OVER ON ONE: News that would have filled pages in the pre-war "dailies" rated only a few inches last week, when 61-year-old Mrs. Marion Hart flew the Atlantic from Newfoundland to Shannon in a Beechcraft Bonanza (205 h.p. Continental). Next to her, photographed at Shannon, is Wayne Vetterlein, P.A.A. navigator, who acted as co-pilot; left is Mr. Modine, P.A.A. station manager at Shannon, and on the right is an Esso representative.

PRELUDES AND



Growing urge: Bristol Proteus 705 turboprops in the Britannia.



Acoustic thrust: Saunders-Roe pulsejet.

AS invariably happens in the few days preceding the S.B.A.C. Display, new aircraft are disclosed for the first time and fresh details of known types are made public. Collected on these pages are several last-minute pictures and news items, and it is certain that the Display itself will produce further evidence of British progress.

The Bristol Britannia Prototype, as will be seen at Farnborough, is powered with Proteus 705 turboprops. This mark has passed the normal-category official 150-hr type-test at 3,320 s.h.p. plus 1,200 lb residual jet thrust, so giving a total output of 3,781 e.h.p. It has been selected for the ten Britannia Mk 100s now in super-priority production for B.O.A.C. Later, larger Britannias —the Mks 200, 250 and 300—are to be powered with the even more advanced Proteus 755 of 4,150 e.h.p.

From Bristol Observers comes news of a first flight on Monday last of a Type 173 helicopter with stub wings fitted—in anticipation of the appearance of the Mk 3 which is, in addition, to have Leonides Major engines.

In Prospect as a 50-passenger "rotor coach" to B.E.A. requirements is the Saunders-Roe helicopter, a flying impression of which appeared in our previous issue. The rear loading doors, undercarriage layout and pusher propeller are among the features particularly worth noting in this ambitious design shown below.

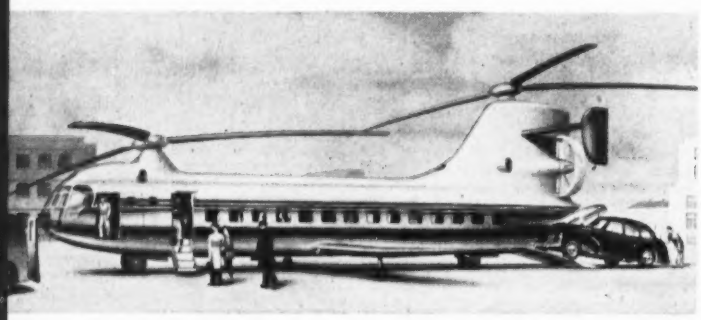
First Disclosed by Mr. Henry Knowler in his lecture "The Future of the Flying Boat," reviewed in *Flight* during March, 1952, the Saunders-Roe hydroski fighter project is illustrated here. On that occasion it was stated that the intake was to be in the form of a pitot entry above the fuselage.

The Addition of Pulsejets to the range of British power units (their introduction by Saunders-Roe, Ltd., was recorded last week) is justification for reminding readers that the operation of this type of unit is comparable with that of a two-stroke internal combustion engine, assuming the piston of the latter to be replaced by a column of air. A tip-pulsejet is shown above.

A mixture of fuel and air enters the combustion chamber, where it is ignited by a sparking plug. The resulting explosion drives the air column to the rear, thereby creating thrust reaction and causing the gases to escape from the open end of the chamber in a manner similar to the power-and-scavenge process of the two-stroke cycle. There is, of course, no counterpart to the crank-case compression and transfer of mixture in the two-stroke, but the rapid ejection of exhaust gases causes a depression in the chamber of the pulsejet, causing fresh air to flow through the automatic inlet valves at the front. Fuel is injected at the appropriate time and the returning air "piston" from the exhaust end of the pulsejet compresses the mixture and closes the valves. The mean temperature of the mixture being high, spontaneous ignition occurs and the cycle repeats itself. The frequency of the cycle is determined by the acoustic properties of the chamber. The Saro pulsejet units are being developed by the company's Helicopter Division.

Vickers Plan to demonstrate the newly completed "Pathfinder" B.Mk 2 version of the Valiant during Farnborough week. Their other machine, the second to be built, is being prepared for the New Zealand Race.

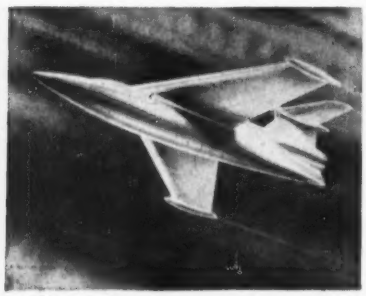
A New Chapter in the success story of the Comet began on August 27th, when John Cunningham made the initial flight



In prospect: The Saunders-Roe "rotor coach."

Built for Avons: The first Series II Comet (right).

Project P.121: Saunders-Roe hydroski fighter (below).



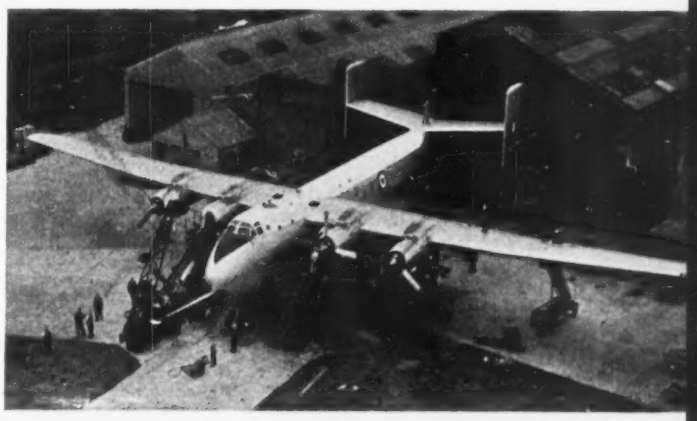
OVERTURES

of the first Avon-powered Series 2 production aircraft. The flight began at 5.28 p.m. and lasted 62 minutes. This air view accentuates the increased fuselage length of the new version (96ft, compared with 93ft). With four Rolls-Royce Avons at present rated at 6,500 lb thrust each, the Series 2 is 30 per cent more powerful than the Ghost-powered Series 1, carries 44 passengers instead of 36 and cruises slightly faster over longer stages of up to 2,200 miles. Notified of the flight, Sir Miles Thomas signalled to Sir Geoffrey de Havilland: "May this be the forerunner of many million miles of further co-operation between de Havilland and the B.O.A.C." If the development programme permits, the Comet 2 will make one or two flights over Farnborough during next week's S.B.A.C. display.

Vic to perfection: Avros' Vulcan and 707 As, B and side-by-side C.

Family Outing.—A ruler placed along the port leading edge of the Vulcan, leading the picturesque gaggle of Avro deltas, seen in the picture, passes first along the corresponding leading edge of the dual-control 707C, then along that of one of the two 707As now flying. In corresponding formation to starboard are, first, the 707B, then the second 707A. The pilots when the historic photograph was secured by Avro staff photographer Paul Cullerne, A.I.B.P., were: Vulcan (W/C. R. J. Falk, A.F.C.); 707As (S/L. H. T. Murley, D.S.C., A.F.C., and F/L. J.K. Hough); 707B (S/L. W. J. Potocki, D.F.C.); 707C (F/L. J. E. Burton). The squadron leaders and flight lieutenants are R.A.E. test pilots. Flying as passenger in the 707C, was G/C. S. W. R. Hughes, O.B.E., A.F.C., in charge of experimental flying at Farnborough. The same pilots are likely to be manning these deltas at the S.B.A.C. Display.

Being Made Ready for Farnborough, as seen in the photograph, is the Blackburn Beverley C.1. This intimate glimpse of the giant's toilet was secured from the Pest Control helicopter which followed Lord Noel Buxton during his walk across the River Humber.

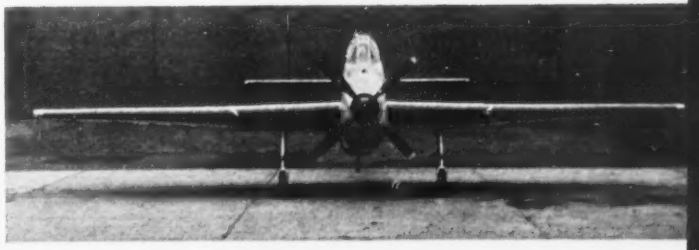


Sprucing up: The Blackburn Beverley C.1 at Brough.

Seamew A.S.1 is the designation of Short's S.B.6 light anti-submarine aircraft, specifically designed for operation from the escort carriers of NATO forces and here depicted for the first time. The initial flight was made on August 23rd at Sydenham, Belfast, the pilot being S/L. W. J. Runciman, A.F.C., D.F.M., who has made all subsequent flights and is likely to be demonstrating the machine at Farnborough. Power plant of the Seamew is an Armstrong Siddeley Mamba, and the utilitarian appearance of the aircraft is accounted for by the simplicity and cheapness of its construction. Features in evidence are the long weapons bay, high-lift devices, and the forward-placed cockpits, offering an exceptionally wide field of view. A production order has been placed on behalf of the Royal Navy.

The Ministry of Supply's Stand at the Farnborough Show seldom fails to provide something new and of considerable technical interest, and advance details of this year's M.o.S. exhibits suggest that this reputation will be maintained next week. Of particular interest in view of recent official disclosures will be one of the telemetering systems used to measure the performance of guided missiles in flight, together with examples of recording instruments used in conjunction with them.

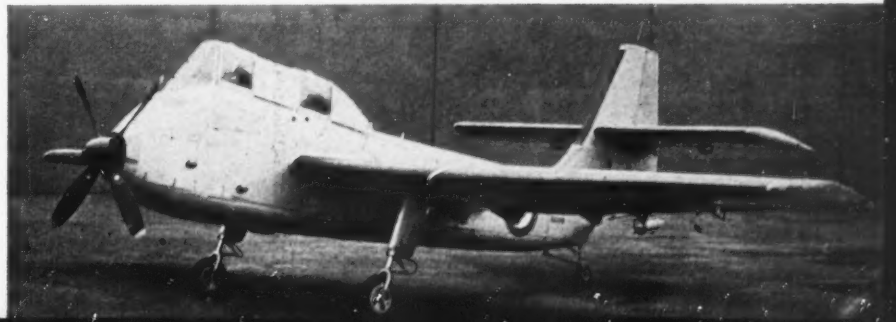
Two cameras, the F.89 Mk 2 and F.97 Mk 2, developed by the R.A.E. and Aeronautical and General Instruments, Ltd., will also appear. These are both designed for night photography, the first at high level and the second at low. The F.89 Mk 2 has a long-focus lens to preserve scale, and an inter-lens shutter photo-electrically tripped to limit exposure time when a high power flash-bomb is used. The low-level F.97 Mk 2 has a continuously running wide film to facilitate the taking of over-lapping pictures at high speed and low level.



Brand New: Two aspects of the Short Seamew A.S.1. at Belfast.

Another exhibit will consist of various automatic observers to check the performance of autopilots, both in normal and abnormal conditions.

The result will be shown of a long series



of experiments made in the search for fire-detecting materials which will retain their stability in close proximity to the high operating temperatures of modern aero-engines. A material developed by the Chemistry Department of the R.A.E. is characterised by a rapid change of electrical resistance with change of temperature. It is robust and pliable and will continue to function without resetting after being exposed to fire. Its composition can be adjusted for operation at various temperatures.

Another important exhibit is a fatigue meter which measures the number of times each of six pre-determined acceleration limits is exceeded. The instrument works from a 24-volt supply and weighs 3.5 to 3.8 lb. It is at present on test in a Viscount.

Possibly the most spectacular exhibits on the M.o.S. stand will be the Ladybird and Scarab solid-propellant rocket motors. Designed to provide additional take-off boosts, they were developed by the Rocket Propulsion Department of the R.A.E. at Westcott. The Scarab produces 3,000 lb thrust for six seconds, a total impulse of 20,000 lb-sec, and the Ladybird produces 1,500 lb thrust for the same period, equal to 10,000 lb-sec. Filled weights of the Scarab and Ladybird are respectively 175 lb and 100 lb.

Finally, the methods employed in recording technical information and keeping it immediately available will be demonstrated by the Ministry of Supply's Technical Information Bureau. These include the Universal Decimal classification system and the micro-card system with special viewers.

FOR THE VISITOR TO FARNBOROUGH

THIS year's S.B.A.C. Flying Display and Exhibition, the fourteenth to be held, will again take place at the Royal Aircraft Establishment's airfield at Farnborough, Hants, and will last from Monday next, September 7th, till Sunday, September 13th. Monday, the 7th, will be the Press and technicians' preview day. Tuesday, Wednesday and Thursday, the 8th, 9th and 10th, will be private days reserved for guests of the S.B.A.C.; and the public days will be on Friday, Saturday and Sunday, the 11th, 12th and 13th. The Friday will be known as the "public première," admission charges being higher than on the Saturday and Sunday.

The S.B.A.C. has issued the following route guidance for motorists arriving at Farnborough on the public days, and states that it is highly advisable that these routes should be adhered to:

From London: Over Putney Bridge, then *via* the Kingston by-pass to Esher; thence along A.3 to Cobham, Ripley and Guildford and, turning right at the Guildford by-pass, to follow the R.A.C. signs. An alternative route is *via* Hyde Park Corner, Knightsbridge and Hammersmith to the first roundabout on the Great West Road, then left along A.30 to Staines, Egham, Sunningdale, Bagshot and follow the R.A.C. signs.

From East Anglia: Follow A.412 from Watford to Slough, then A.332 through Windsor and Ascot to Bagshot; then fork right along A.30 to the "Jolly Farmer" public house and thence follow the R.A.C. signs.

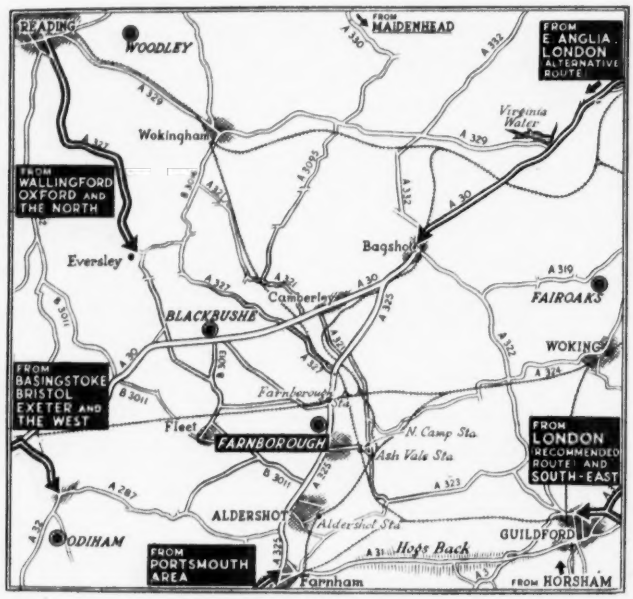
From the North: Follow A.423 from Oxford to Wallingford, there joining A.329 for Reading. Then take A.327 to Eversley and follow the R.A.C. signs onward.

From Exeter, Bristol or Gloucester: Take A.30 from Basingstoke to the Dorchester Arms public house, fork right to Odiham and follow the R.A.C. signs.

From the Portsmouth area: Should follow A.3 to Petersfield and fork left at Sheet on to A.325, continuing *via* Liss, Greatham, and Bordon to Farnham; then follow the R.A.C. signs.

For those travelling to Farnborough by train British Railways are again issuing an inclusive return ticket from Waterloo at 8s 6d. This covers the rail journey to Aldershot station, the short bus journey on to the airfield, and the return to London.

Admission prices for adults and children (under 16) on Friday, September 11th, are £1 and 10s respectively. Parking fee for private cars will be £1, for motor cycles 5s, for pedal cycles 2s 6d, and for motor coaches £1: occupants and drivers or riders of these vehicles pay the normal admission fees in addition. Advance bookings *for Friday only* may be made through Auto-Parks, Ltd., 1 Maclise Road, London, W. 14 (Shepherds Bush 5385) or through agencies.



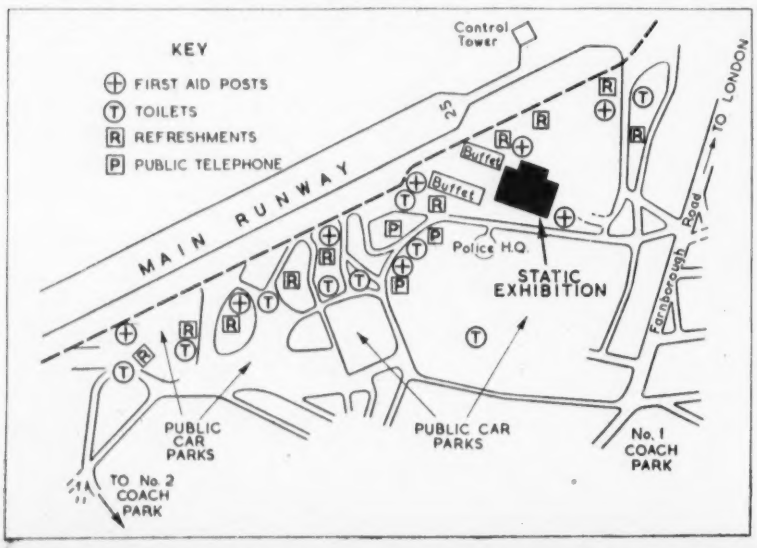
The roads in the Farnborough area. Motorist-visitors are particularly asked by the S.B.A.C. to use the approach-routes detailed on this page.

For Saturday and Sunday, September 12th and 13th, admission prices are: adults 5s; children (under 16) 2s 6d.; private cars £1 10s, including up to 6 occupants; motor cycles, 2s 6d parking fee—riders and passengers pay normal admission fees; pedal cycles, 1s parking fee—riders pay normal admission fees; motor coaches, £1 parking fee—occupants pay normal admission fees. Advance bookings cannot be made for these two days.

Gates are open from 10 a.m. to 7 p.m. on the "public" days; flying starts at 3 p.m.

No visiting aircraft may land at Farnborough; they must use Blackbushe airport. For guests invited by the S.B.A.C. and landing at Blackbushe there will be road transport onward.

Other information affecting pilots of aircraft flying in the neighbourhood of Farnborough has been issued by the M.C.A. The danger area during the display periods extends from sea-level to 11,000ft within ten nautical miles of Farnborough (excluding part of the London Control Area) and from 11,000ft to 50,000ft within a 20-n.m. radius. At other times Farnborough A.T.C. permission will be required to fly within three nautical miles of the airfield below 50,000ft—a height which seems sufficient to deter most inquisitive pilots. Full details of the Farnborough restrictions and of arrangements for using Blackbushe during the display period are set out in M.C.A. *Notams* Nos. 554-5.



Arrangement of the enclosures and parking facilities for the three "public" days. A plan of the interior arrangement of the exhibition hall appears on page 350.

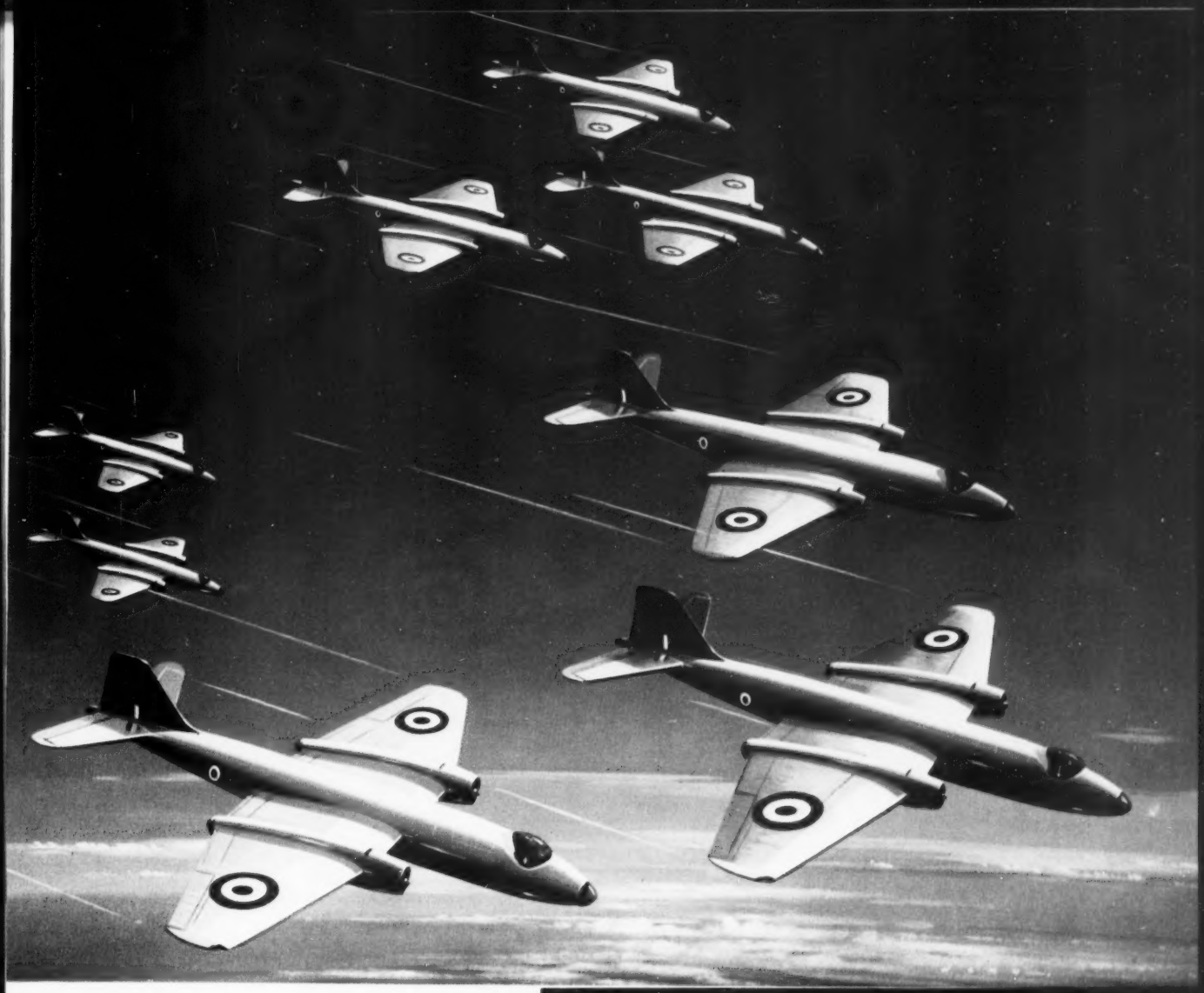
Partners in Air Progress

Partners in Air Progress

Each a pioneer in its own field, the Companies of the 'ENGLISH ELECTRIC' Organization form an aviation group unique in scope and experience.

No other organization contributes on so broad a front to the development of aviation in all its aspects — research, design, production, and operation, military and commercial.

In Great Britain the Canberra jet bomber, designed by 'ENGLISH ELECTRIC' and powered by Rolls-Royce Avon engines, is in full-scale super-priority production.



'ENGLISH ELECTRIC'
Canberra

POWERED BY ROLLS-ROYCE AVON ENGINES

The only jet bomber in squadron service with the Royal Air Force

Holder of 8 World Records	In production in 6 factories	Choice of 4 Air Forces

Designed and built by THE ENGLISH ELECTRIC COMPANY LIMITED

Partners in Air Progress

It is also being produced under licence in Australia for the R.A.A.F. and in America for the U.S.A.F. The first jet bomber to go into service with the Royal Air Force, the Canberra has, by its outstanding performance — particularly at altitude — profoundly influenced the strategy of defence. This performance has been demonstrated by an unequalled series of world record flights, including the double Atlantic crossing, England to Australia and — with Bristol Olympus engines—the International Height Record for Aeroplanes.

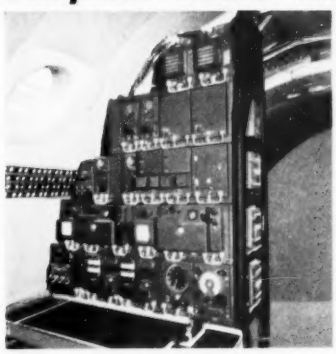
First and greatest name in wireless, MARCONI'S WIRELESS TELEGRAPH COMPANY pioneered practical air radio and, today, maintain their long-established lead in all branches of the science. Marconi radio equipment is borne by many of the world's most famous aircraft, while all aspects of ground to air and ground to

MARCONI

Airport & Airborne Radio Systems and Navigational Aids

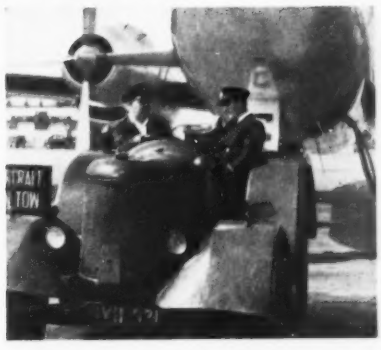
Marconi radio equipment is giving faithful service to airline operators, airport authorities and air forces, all over the world.

Complete Radio Installations for Air Communications



Marconi airborne radio equipment is fitted to most British aircraft flying the world's air routes and by 22 of the world's air forces.

Flight tests on the first Marconi V.O.R. (V.H.F. Omni-Directional Radio Range) installation in Britain, by the American Civil Aeronautics Administration, were "very satisfactory".



Marconi mobile radio provides more reliable and quicker airfield control of aircraft, despatchers, servicing and tractor crews and auxiliary services.

Partners in Air Progress

ground communication and the most advanced navigational aids are represented in the numerous Marconi airport installations. In the NAPIER COMPANY the Group enjoys the partnership of a firm whose engineering standards are world-famous. A long line of great Napier engines has shown an originality of conception which is much in evidence in the latest Napier products — the Nomad, the world's first compound gas-turbine/diesel engine, and the 3000 e.h.p. Eland propeller turbine of outstandingly light weight and low consumption. Both these engines make available hitherto unapproachable standards of operating economy. The airframe, the engine and the means of communication and control—these represent the wide field of development pioneered by the partner companies of the 'ENGLISH ELECTRIC' Group.

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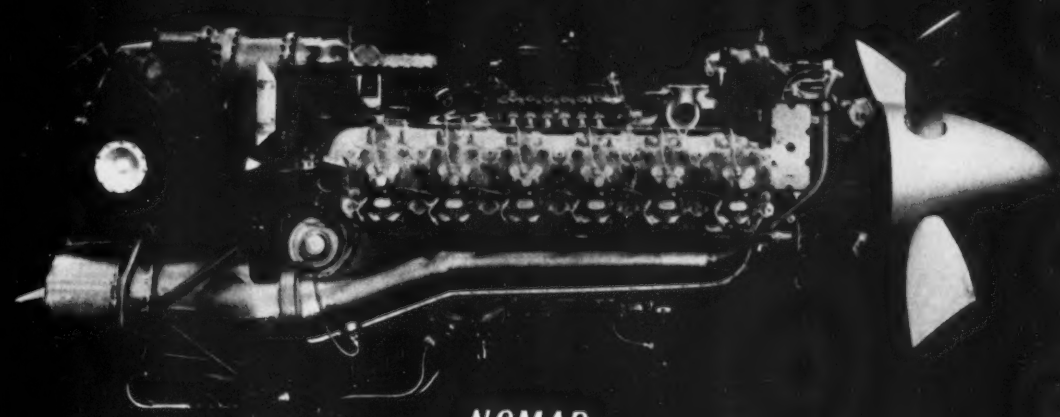
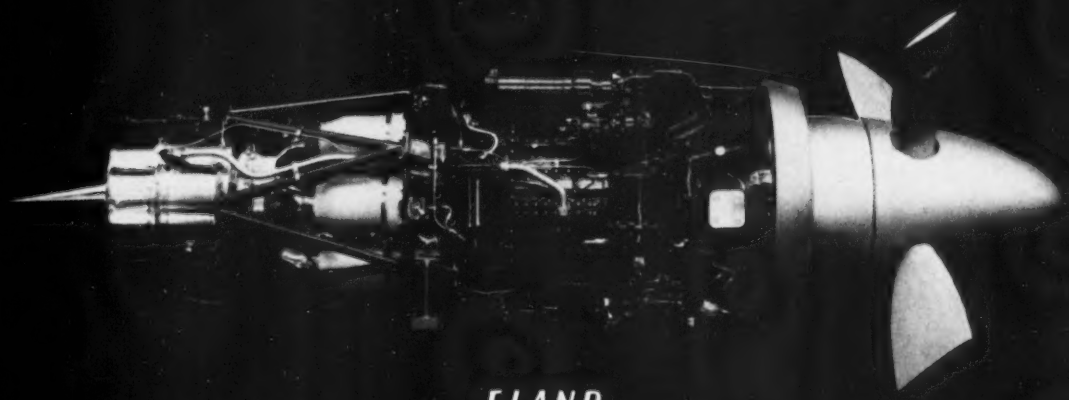
Queens House, Kingsway, London, W.C.2

MARCONI'S WIRELESS TELEGRAPH CO. LTD.
Marconi House, Chelmsford, Essex

D. NAPIER & SON LIMITED
London, W.3



NOMAD



ELAND

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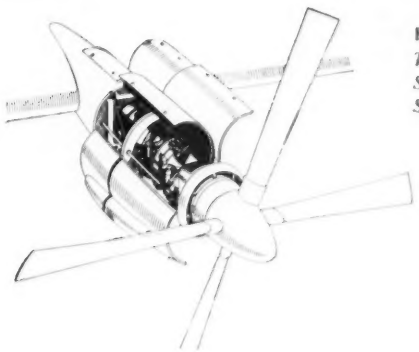
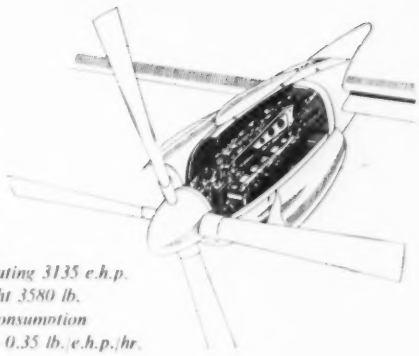
Nomad · Eland

Two engines for all-range flying over a wide altitude band, each distinguished by economy superior to any other comparable powerplant.

All-range, ultra-economy aircraft engines



ELAND
Takeoff Rating 3000 e.h.p.
Specific Weight 0.52 lb./e.h.p.
Specific Consumption
0.47—0.49 lb./e.h.p./hr.



NOMAD
Takeoff Rating 3135 e.h.p.
Dry Weight 3580 lb.
Specific Consumption
0.33 to 0.35 lb./e.h.p./hr.

Partners and Pioneers

'ENGLISH ELECTRIC'
Canberra

first aircraft to fly to over twelve miles altitude; first jet bomber in squadron service with the Royal Air Force and to span the Atlantic; chosen by four air forces, in production in three countries, holder of eight world records.

MARCONI
Air Communications

first radio company in the world, first air-ground radio experiments; first production air radio set; first aircraft ignition screening harness; first fully miniaturised radio equipment for civil aircraft; first airport D/F; first British V.O.R.; first fully suppressed aerial system for aircraft.

NAPIER
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first compound gas turbine/diesel engine in the world: the first advance of such magnitude in the search for operating economy, far extending the practical limits of long-range commercial operation.

BRITISH AIRCRAFT 1953

WITH competition at its keenest ever it is small wonder that Farnborough observers will include some of the shrewdest technicians and hardest-headed business men in the world. People of this sort are not accustomed to jump to conclusions on superficial evidence, and they are not to be swayed by facile sales talk or flashy demonstrations. They are seekers after hard facts, and upon their ability to amass and analyse these facts may depend the expenditure of millions of pounds, world prestige and even, in the ultimate, the military security or commercial solvency of a nation.

For such men even the assiduously planned arrangements which are so characteristic of Farnborough are still not wholly adequate. For one thing, it is not possible to demonstrate visually all the essential qualities of an aircraft; nor can the bulkiest and most graphic sales brochure supply the entire balance of the information sought. Only personal discussion and enquiry, for which the marquees, caravans and enclosures of Farnborough are convenient and pleasant settings, will satisfy such questing minds—pending (we may hope) final business with contract and cheque-book.

There can be few Farnborough visitors, of course, who will be following only a solitary line of enquiry—who will not at least take a lively interest, even if it is not of the strictly business kind, in the remarkable variety of aircraft displayed. Thus, we may hope that the annual review which follows—of 60-odd types of aircraft this year—will prove as companionable as ever as a show-guide and, as in former years, a pointer to British progress.

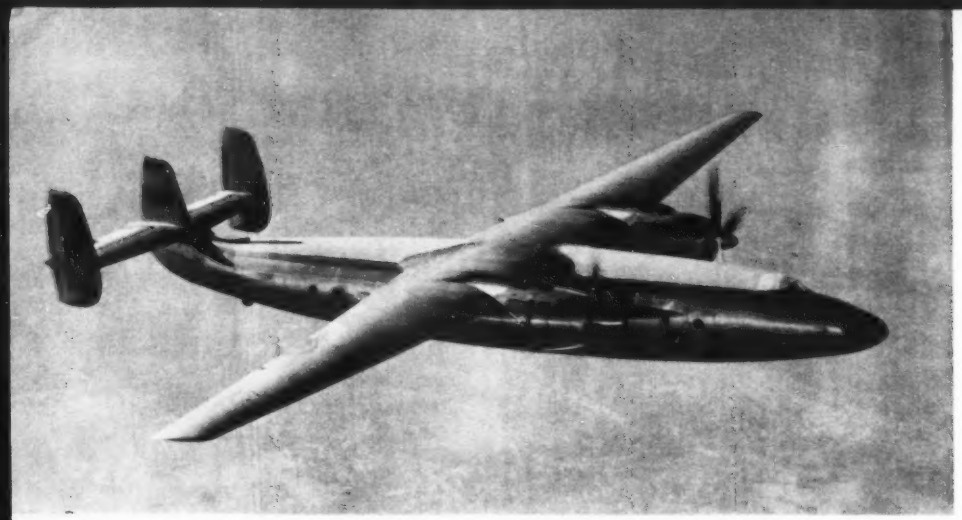
The small number of wholly new types of aircraft is not a sign that our designers have proved dilatory in their efforts. True, the Hawker Hunter and Supermarine Swift interceptors will be remembered, in their earlier forms, from previous years; but, as now demonstrated, each is an even better flying machine and a more formidable weapon. The same is true of the all-weather Gloster Javelin and D.H.110—indisputably in a class by themselves. Among the jet bombers—the Avro Vulcan, Handley Page Victor, Vickers Valiant and English Electric Canberra—the Victor is the only newcomer; but so little information has been disclosed concerning the capabilities of these four types that each one remains something of a dark horse. It is, of course, no secret that the de Havilland Comet and Vickers Viscount airliners have set entirely new standards for commercial aircraft; nor, happily, is it treasonable to suggest that the Bristol Britannia bids fair to parallel their achievements.

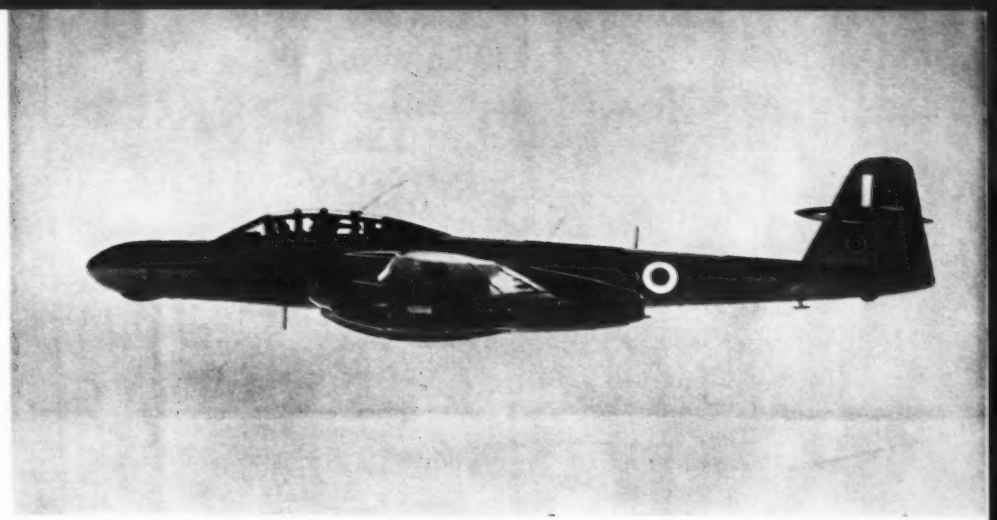
Within the purlieus of the Static Exhibition will be found models of things to come; and here—in response to particular lines of enquiry—spokesmen will doubtless display those curious, clam-like proclivities which are evidence of even more intriguing projects ahead.

Described hereafter are machines for most types of civil or military work. It will be seen that helicopters have not been segregated, for they are now an established class of aircraft, capable of challenging the fixed-wing species in many fields of activity—and even of surpassing them in efficiency. The research and development machines by no means represent the total, for many other flying test-beds continue to play less spectacular, but none the less essential, rôles.

The Commonwealth has its own sub-section, but we have not seen fit to include special versions of British aircraft built abroad, such as the Martin B-57A development of the Canberra, for night interdiction. By the same token we make no mention of foreign airframes adapted to take British or Commonwealth power plants, the leading examples of which are the Australian-built Avon-Sabre and Canadair-built Orenda-Sabre.

It will, we think, be agreed that the ranks of British aircraft, 1953, stand in no need of such recruits as these, admirable in quality though they are.





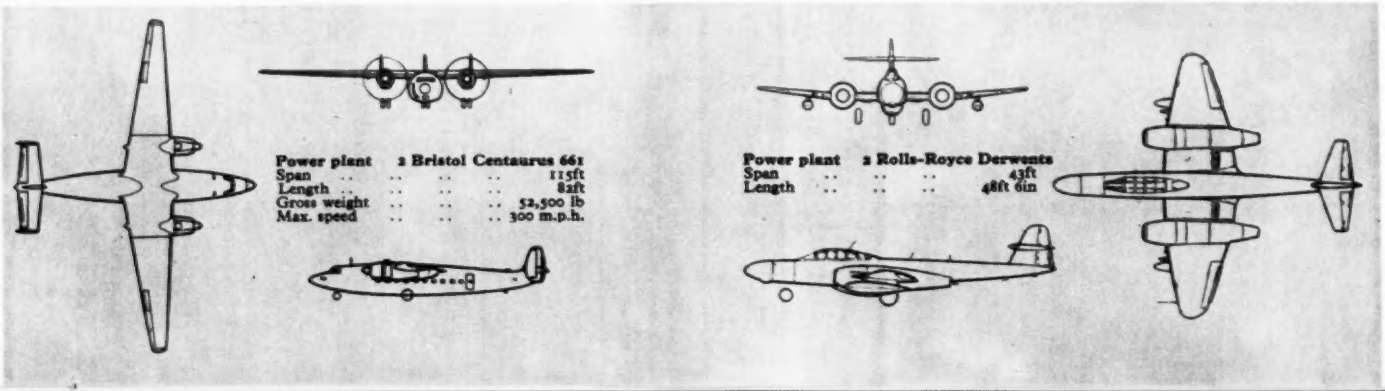
D.H. Airspeed Ambassador

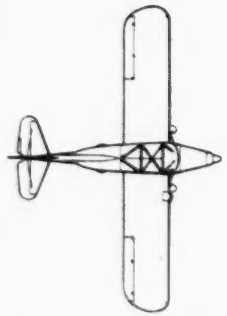
PARIS, Nice, Rome, Amsterdam, Vienna and Hamburg are among the many cities served by B.E.A.'s stately Elizabethan-class Ambassadors. The fleet was completed by the delivery of the 20th aircraft on March 6th, and is now being intensively operated. The passenger-appeal of the roomy 47-seat cabin, with its unobstructed downward view, has won a good deal of traffic for B.E.A., whose chief executive recently observed: "The operating costs of the Elizabethan are coming down steadily, and I wish that we had 30 instead of only 20 . . . We could use them all." By the end of May these aircraft had carried 155,000 passengers in the preceding 12 months and earned £2m revenue. The Elizabethan's power units are two 2,600 h.p. Bristol Centaurus, giving a cruising speed of 245 m.p.h. at 15,000ft. In present form, the type is assured of a long and successful term of passenger service with B.E.A. Overseas reports have mentioned the possibility of re-fitting a number of Elizabethans with compounded Napier Nomads when the time comes for their relegation to freighting duties.

Armstrong Whitworth (Gloster) Meteor Night Fighters

THE least-trained eye will instantly perceive that the Meteor N.F.II and its superficially similar derivative, the N.F.13, have the distinctive features of the famous Gloster Meteor family. The prefix "Armstrong Whitworth" may, therefore, prove puzzling. The explanation is that when a night fighter with the basic Meteor airframe became an operational requirement, the work of adaptation was passed to the sister firm of Sir W. G. Armstrong Whitworth Aircraft, Ltd. This entailed the incorporation of a "radar" nose, the so-called "long span" wing (as on the photographic reconnaissance Meteors), and the transference of the four 20 mm guns outboard of the nacelles. Although tip-mounted auxiliary tanks were developed for the N.F.11 (were, in fact, displayed at Farnborough two years ago), under-wing tanks remain standard, in addition to the usual 180-gal ventral tank. Notwithstanding its heavy load of armament, tanks and radar, the night fighter Meteor is a lively machine to handle, due in part to the spring-tab ailerons.

BRITISH AIRCRAFT 1953





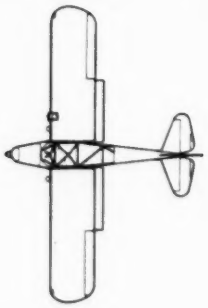
Power plant — Blackburn Bombardier 702

Span	37ft
Length	24ft 8in
Gross weight	2,700 lb
Max. speed	121 m.p.h.

Power plant — D.H. Gipsy Major

Span	36ft
Length	23ft 2in
Gross weight	2,210 lb
Max. speed	123 m.p.h.

(Data, drawing and photograph for A.O.P.6)

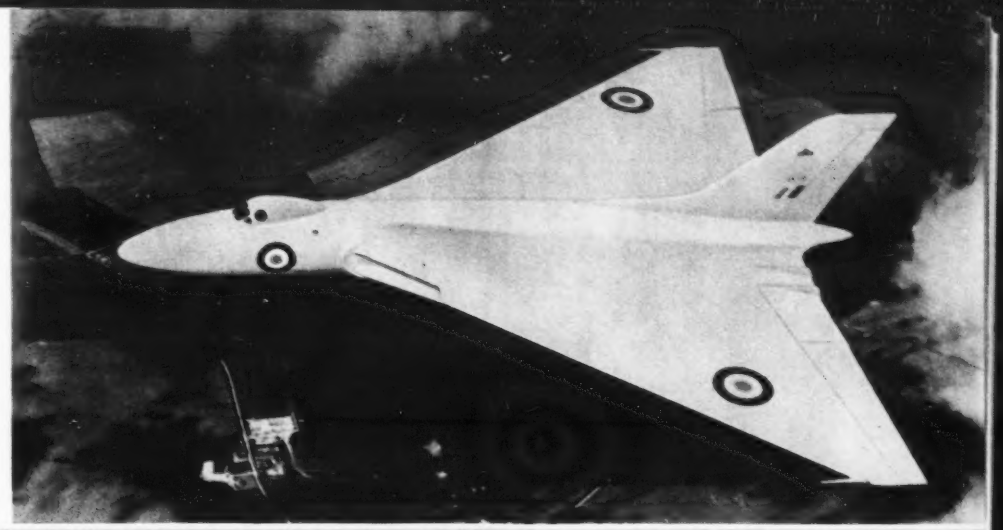


Auster Ambulance/Freighter

ALTHOUGH Ambulance/Freighter is a long name for a small (2,700 lb) aircraft, it merely hints at the diversity of rôles for which this versatile lightplane was designed. Passenger, supply-dropping, cable-laying, survey and agricultural work are all within its capabilities. The rear-loading hold, with a volume of 110 cu ft, will accommodate four passengers or—with doors removed (and this does not affect handling)—loads over 15ft in length. The 180 h.p. Cirrus Bombardier, which has a cartridge starter, gives a speed of 105 m.p.h. over 280 miles, for which the corresponding payload is 580 lb. Take-off performance is excellent: against a 5 m.p.h. wind the Ambulance/Freighter becomes airborne in 240 yd, and clears 50ft in 430 yd. Since the prototype made its first appearance at Farnborough two years ago, the handling qualities have been improved, notably by an increase in vertical-tail area. Its manufacturers intend to produce the Ambulance/Freighter in numbers; several firm enquiries have been reported; they come from widely varying parts of the world, particularly Australia.

Military Austers

AS already mentioned, the Ambulance/Freighter has numerous military applications, and its effectiveness in certain rôles has already been proved on operational exercises. Under the present heading are considered the Auster Air Observation Post (A.O.P.) machines. Best known of these is the A.O.P.6, which gave a splendid account of itself over the Korean front lines, as described in *Flight* of July 3rd. An essentially similar version is the T.7, which, as its designation implies, is a two-seater trainer but is rapidly convertible for service as an A.O.P. The differences are to be found exclusively within the cabin; whereas the A.O.P.6 has a pilot's seat, with radio to starboard, and a rotating observer's seat in the rear, the T.7 has side-by-side seating for an instructor and pupil. In the A.O.P. rôle the T.7 is fitted with an Army-type radio. Whereas the two above-mentioned models are powered with Gipsy Major engines, a later machine, the A.O.P.9, has the more powerful Blackburn Bombardier. This type has been developed from the Auster Model S, demonstrated at the S.B.A.C. Display in 1951.



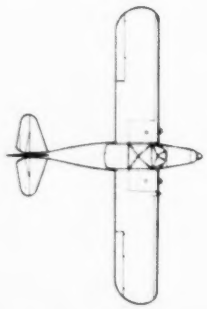
Auster Civil Variants

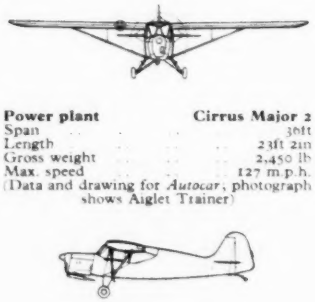
THE number of Auster civil light aircraft sold since the war has passed the 800 mark and is still increasing steadily. Most popular of the current series are the Aiglet Trainer and Cirrus Autocar. The former, which is fully aerobatic, cruises at 109 m.p.h. on its 130 h.p. Gipsy Major 1, and has a maximum speed of 125 m.p.h. Its take-off run (5 m.p.h. wind) is only 170 yd, and the stalling speed is 38 m.p.h. With 32 gal of fuel, this lively two-seater has a range of 500 miles. A Cirrus Major 2 of 140 h.p. powers the Cirrus Autocar, which accommodates a pilot and three passengers, and cruises at 110 m.p.h.; with a 650 lb load the Cirrus Autocar will cruise 520 miles on 32 gal. Also in production is the standard Aiglet, a three-seater with Gipsy Major 1. The Aiglet Trainer, with shorter span giving stepped-up performance and livelier "feel", is also supplied as a sporting three-seater. Crop-dusting and-spraying Aiglets and Autocars are also in production. The economical Autocrat, though no longer built, continues to give valued services to many clubs and private owners.

Avro Vulcan

ALL who were fortunate enough to witness the début of this unique delta-wing jet bomber at the previous S.B.A.C. Display will certainly not have forgotten its amazing performance on that occasion, particularly in respect of manœuvrability. Since that time a great amount of development flying has been completed, and an even more remarkable performance may be expected this year. It has been averred by the Minister of Supply, Mr. Duncan Sandys, that the advent of the Vulcan represents a "dramatic leap" in the progress of British aviation and might well have a profound influence upon future development of air warfare. "The bold decision to adopt the triangular wing for an aircraft of this size and to dispense with the tailplane," he said, "was an act of faith for which the designers and manufacturers deserve the highest praise." On its first appearance—indeed, until fairly recently—the Vulcan B.1 was flying with four Rolls-Royce Avon turbojets; as seen at Farnborough, however, it will have four Armstrong Siddeley Sapphires. Production versions are to be powered with four "two-spool" Bristol Olympus.

BRITISH AIRCRAFT 1953

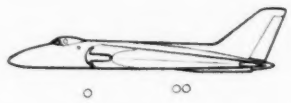


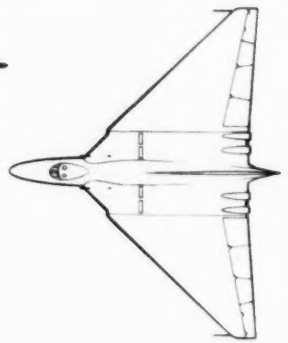


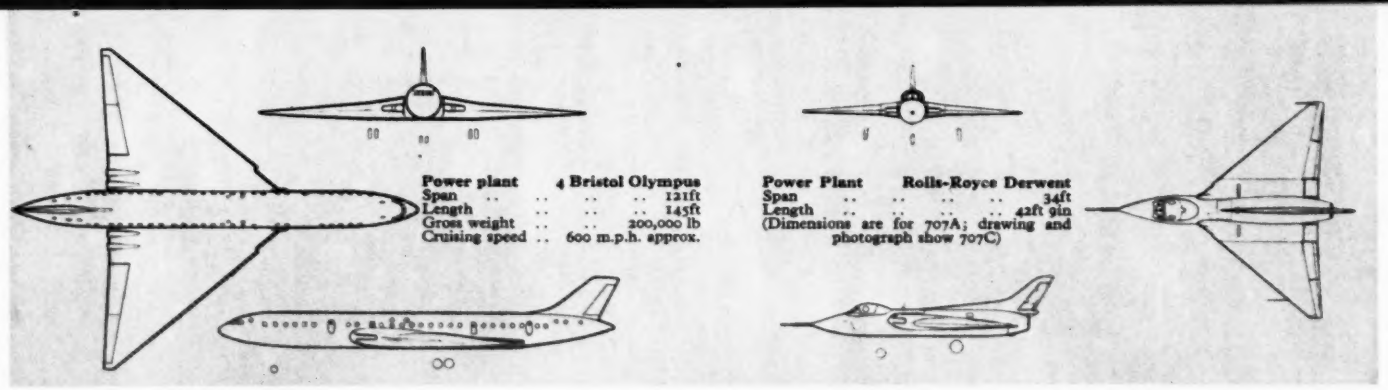
Power plant	Cirrus Major 2
Span	36ft
Length	23ft 2in
Gross weight	2,450 lb
Max. speed	127 m.p.h.

(Data and drawing for *Autocar*, photograph shows Aiglet Trainer)

Power plant
4 Armstrong Siddeley Sapphires





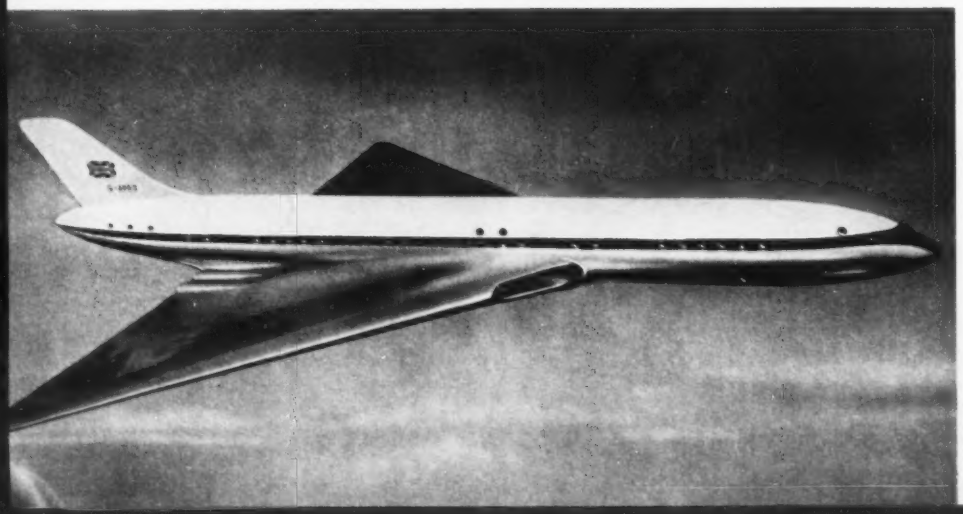

Power plant 4 Bristol Olympus
Span 121ft
Length 145ft
Gross weight .. .. .. 200,000 lb
Cruising speed .. 600 m.p.h. approx.
Power Plant Rolls-Royce Derwent
Span 34ft
Length 42ft 9in
(Dimensions are for 707A; drawing and photograph show 707C)

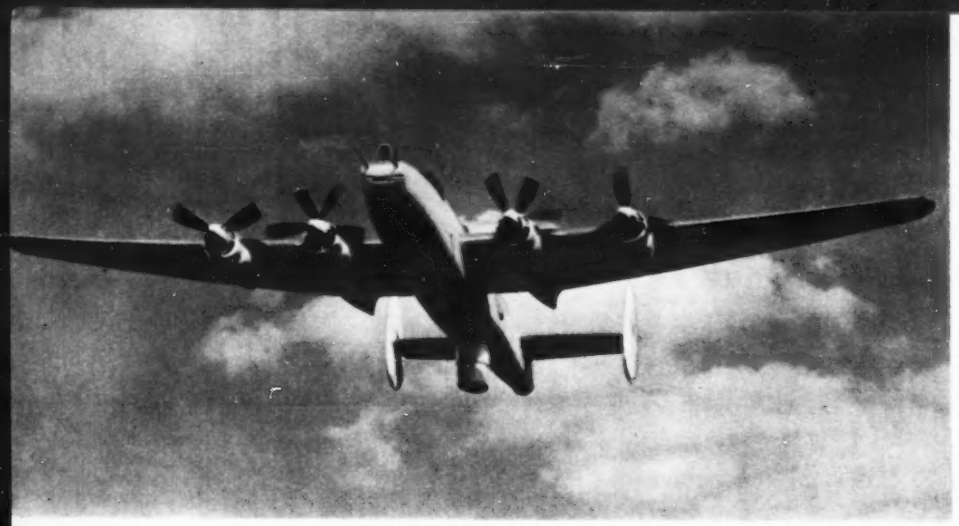
Avro Atlantic

PRELIMINARY data on the Atlantic project were published in June, when Sir Roy Dobson stated that "airlines all over the world have been asking for details of the inevitable transport sequel to the Vulcan . . ." Like that impressive Avro bomber, the Atlantic employs a delta wing which encloses completely four powerful turbojets (Olympus are tentatively specified) and sufficient fuel for flights of up to 4,000 miles. While capable of cruising at a speed of over 600 m.p.h., the Atlantic should offer good low-speed characteristics without recourse to complex high-lift devices. The makers claim that the Atlantic's low operating cost (less than 1d per passenger mile on the North Atlantic route) will be matched by low first cost, due to the simplicity of its inherently robust air-frame. Various seating layouts are proposed—from 76 in a four-abreast luxury version to 131 in a six-abreast high-density version. The pitching of the rearward facing seats would remain constant at 42in, so that whatever the layout adopted, seat rows would always be level with windows. Payload would vary from 20,000lb to 45,000lb.

Avro 707

THE recent completion and flight-testing of the dual-control Avro 707C further extends the sphere of usefulness of a remarkable series of delta-wing research aircraft. The original Type 707 first flew in September, 1949, and was later destroyed in an accident. A second development, designated 707B, took the air in September, 1950, and a third—intended for higher speeds and known as the 707A—dates from July, 1951. The 707C is essentially similar to the "A" variant but, as already mentioned, has dual control, for which side-by-side seating is provided under a broad canopy. It is the "C" which is scheduled for demonstration at Farnborough this year and, like its precursors, this version is powered with a Rolls-Royce Derwent turbojet, aspirated (as on the "A") through wing-root intakes. Comparison with the Vulcan will show that the basic airframe is in all essentials a flying scale model of the bomber. Like the full-size machine, the 707s are equipped with a tail parachute which, when streamed from its fairing, acts as a highly effective brake on the landing run, should such an aid be required.



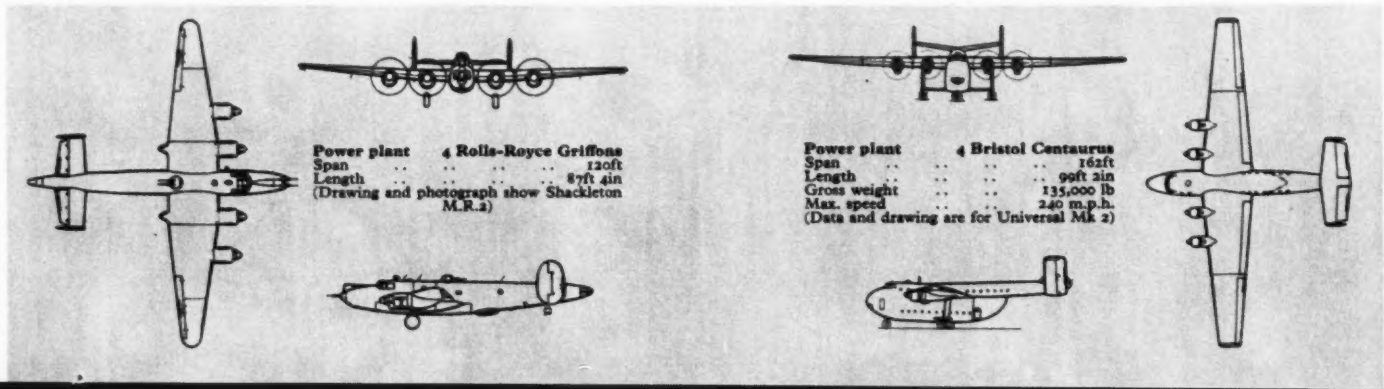


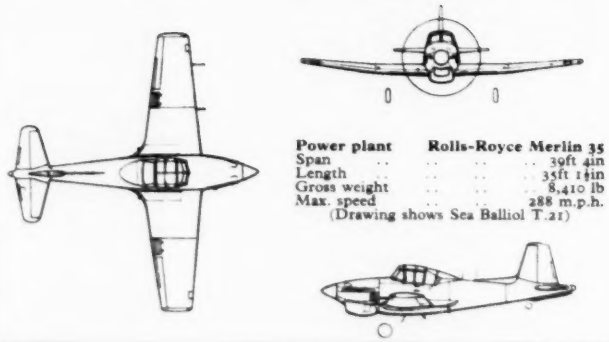
Avro Shackleton

NOTWITHSTANDING the sweeping advances made by gas turbines in most fields of military aircraft development, the piston engine continues to offer numerous advantages as the power plant of long-range, low-level, maritime reconnaissance and anti-submarine aircraft. Thus, the two forms of the Avro Shackleton (M.R.1 and M.R.2) are powered with four Rolls-Royce Griffons, driving de Havilland six-blade, contra-rotating airscrews. Visitors to past Farnborough Displays, and to the international gathering at Le Bourget this year, will vouch for the performance and manœuvrability of the Shackleton—even on two engines. The fuselage is exceptionally roomy and permits the installation of a large quantity of electronic aids, both for navigational and operational use in searching for, locating and striking at, under-water and surface vessels. Within the bomb bay is accommodation for a variety of weapons, in many combinations. The Mk 2 is characterized by the two 20 mm guns flanking the nose (these are aimed by a gunner who sits above the bomb-aimer); twin retractable tailwheels and a faired rear fuselage.

Blackburn Beverley and Universal

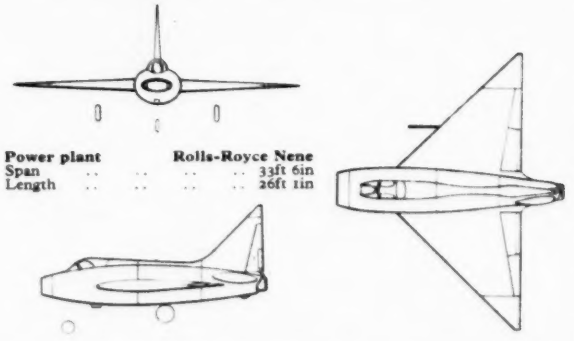
VISITORS—especially those from abroad—may find acceptable a brief account of the development behind the large freight-carrying aircraft now in production for the R.A.F. under the designation Beverley C.1. The design is essentially that of the already familiar G.A.L.60 or Universal, and was itself formerly known as the Universal Mk 2. For a projected civil version (which might alternatively have Napier Nomad engines) the name Universal has, in fact, been retained. Although superficially resembling its precursor, the Beverley is far more powerful, operates at a higher all-up weight, and offers greater stowage space. In place of the original Bristol Hercules engines four Centauruses are installed, increasing the available power by over 3,500 h.p. The Beverley is the first British aircraft designed for the dropping of heavy military equipment, for which purpose the rear loading doors can be removed. Thus, guns, tracked vehicles and light trucks can be put down by parachute, together with their crews and supplies. The machine can operate without prepared runways


Power plant 4 Rolls-Royce Griffons
Span 120ft
Length 87ft 4in
(Drawing and photograph show Shackleton M.R.2)
Power plant 4 Bristol Centaurus
Span 162ft
Length 99ft 2in
Gross weight 135,000 lb
Max. speed 240 m.p.h.
(Data and drawing are for Universal Mk 2)



Power plant	Rolls-Royce Merlin 35
Span	39ft 4in
Length	35ft 1½in
Gross weight	8,410 lb
Max. speed	288 m.p.h.

(Drawing shows Sea Balliol T.21)



Power plant	Rolls-Royce Nene
Span	33ft 6in
Length	26ft 11in

Boulton Paul Balliol and Sea Balliol

POWERED with a Rolls-Royce Merlin 35 engine, the Balliol T.2 is now in service with the R.A.F. as a standard type of advanced trainer. It has side-by-side seats for instructor and pupil and provides training by day or night in flying, gunnery, navigation and armament work; a variant of the same design, designated Sea Balliol T.21, has been built for the Fleet Air Arm. This is distinguished by an arrester hook under the rear fuselage, oleo legs of longer stroke, and an airscrew of smaller diameter. As will be seen from the figures in the table of data, the performance of both types is high, and as long ago as 1949 a Balliol was dived to a speed of 450 m.p.h. During manœuvres in Germany last year Balliols were used experimentally in the ground-attack rôle, and in this connection it may be noted that the normal armament of one 0.303in gun and four 60 lb rocket projectiles or eight 25 lb bombs might be considerably augmented. A production-type Sea Balliol is scheduled for demonstration at Farnborough.

Boulton Paul P.111A

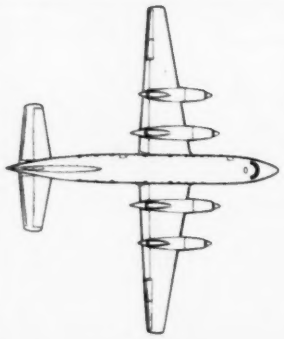
DESIGNATED as above is the newest member of the Boulton Paul family of delta-wing high-speed research aircraft. The first was the P.111, which first flew in October, 1950, and appeared at the S.B.A.C. Display of the following year. During August, 1952, came the announcement of the flight testing of the P.120, which differed from the original machine in being fitted with a tailplane, adjustable for trimming at low and high speeds. The shape of the fin and rudder—triangular in the P.111—was also modified, being of trapezoidal form. In both machines the turbojet was a Rolls-Royce Nene. The P.120 having been destroyed in an accident shortly before last year's Display, the P.111 airframe has been developed into the P.111A, which is essentially similar but has been fitted with air brakes similar to those of the P.120. These consist of four rectangular panels spaced at equal intervals round the fuselage. Certain internal improvements suggested by experience with the P.111 have also been incorporated.

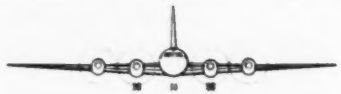
Bristol Britannia

THREE new versions of the Britannia have been announced since the prototype made its first flight a year ago—all larger and more powerful than the Mk 100 now in production. Employing the Proteus 750 of 4,150 e.h.p. instead of the Proteus 705 (3,780 e.h.p.), the new Britannias are the Mk 200 Freighter, the Mk 250 passenger/freighter and the Mk 300 airliner. All have a 10ft 3in fuselage extension, and will thus offer a better capacity payload than the already attractive Mk 100—30,000 lb, compared with 25,000 lb. With its full fuel load of 6,800 gal, the Britannia 300 will carry almost 10 tons for 3,940 miles, and its range with full payload is no less than 5,100 miles. Maximum cruising speed is 389 m.p.h. The economy of the Britannia and its ability to cover long routes with fewer intermediate stops are claimed to give this graceful turboprop airliner an operational advantage over pure-jet rivals. Its seating capacity varies from 60-104, according to layout. B.O.A.C. have ordered 26 Britannias (including ten Mk 300s), and are negotiating for ten more—both Mk 200s and 250s; six lengthened Britannias will be delivered to Qantas in 1956-7, and several other orders are under discussion.

Bristol 170

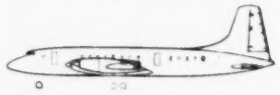
ALTHOUGH the Freighter has been in production since 1946, recent orders have proved that it remains the most suitable aircraft available for many short- and medium-haul operators. The forthcoming delivery of three Mk 31s to Trans-Canada Air Lines will enable the company to carry new classes of cargo at economical rates. The Freighter's ability to handle bulky loads is accompanied by an excellent small-field performance: carrying a payload of nearly six tons, the Mk 31 clears 50ft in just over 800 yd. Two 2,000 h.p. Bristol Hercules give a maximum cruising speed of 192 m.p.h. The A.N.A. "Air Beef" scheme and the Silver City Airways vehicle ferry are two of the best-known freighting projects which this aircraft has made possible. Six Mk 32 Superfreighters (as illustrated), with performance similar to the standard version but with cargo space increased from 2,360 to 3,000 cu ft, are in service with the latter company. Other operators take advantage of the Type 170's passenger-carrying abilities; West African Airways, for example, use a high-density model seating no less than 56 people. Several air forces and governments also use the Freighter.

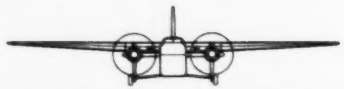




Power plant	**4 Bristol Proteus 750**
Span	140ft
Length	124ft 3in
Gross weight	155,000 lb
Max. cruising speed	389 m.p.h.

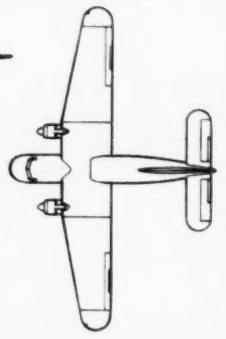
(Data for Mk 300; photograph and drawing show prototype Mk 100)

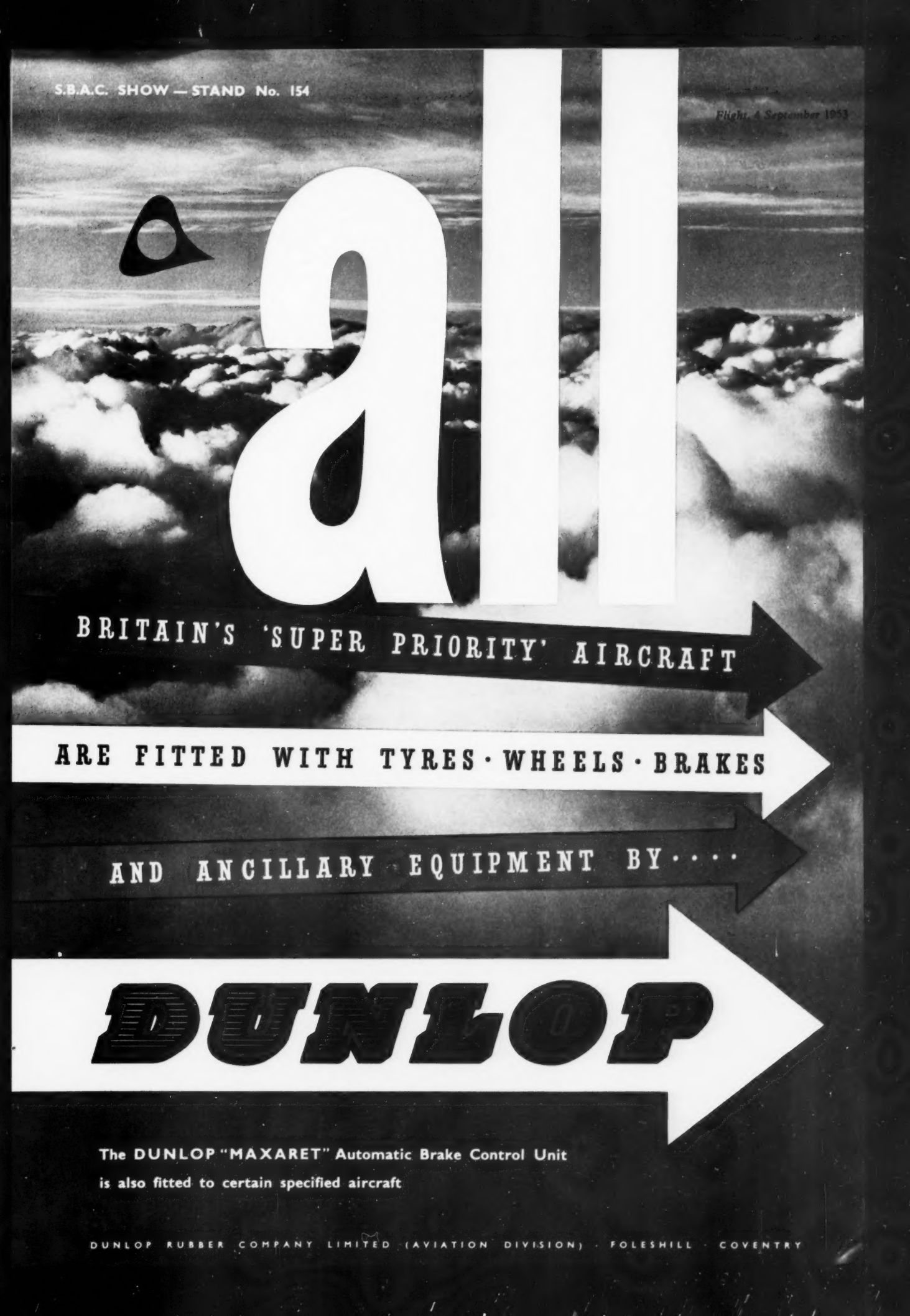




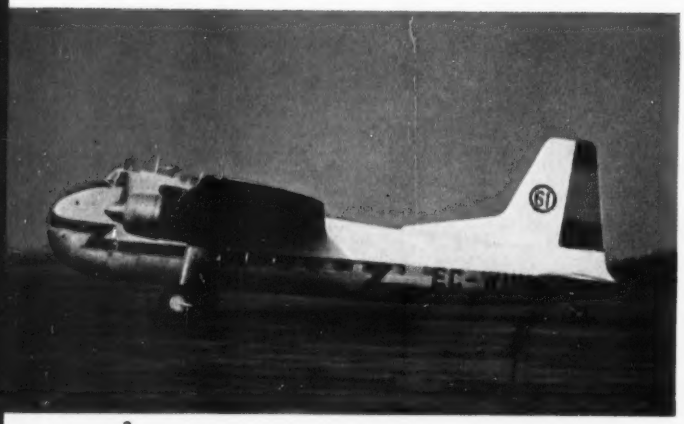
Power plant	**2 Bristol Hercules 734**
Span	108ft
Length	68ft 4in
Gross weight	44,000 lb
Max. cruising speed	192 m.p.h.

(Data and drawing for Mk 31; photograph shows Mk 32)




S.B.A.C. SHOW — STAND No. 154
Flight, 4 September 1953
all
BRITAIN'S 'SUPER PRIORITY' AIRCRAFT
ARE FITTED WITH TYRES · WHEELS · BRAKES
AND ANCILLARY EQUIPMENT BY····
DUNLOP
The DUNLOP "MAXARET" Automatic Brake Control Unit
is also fitted to certain specified aircraft
DUNLOP RUBBER COMPANY LIMITED (AVIATION DIVISION) · FOLESHILL · COVENTRY

BRITISH AIRCRAFT 1953



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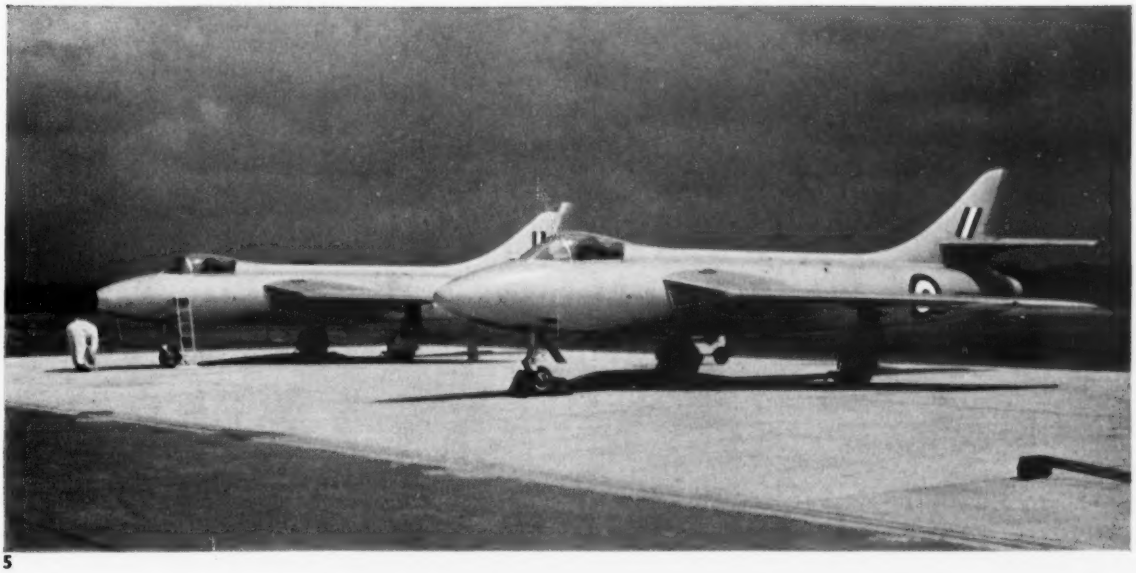
(1) *Hawker Sea Hawk F. Mk 1 single-seat fighters (Rolls-Royce Nenes) in service with the Royal Navy.*

(2) *Bristol Type 170 Mk 31 Freighter (two Bristol Hercules 734s) in the livery of Iberia (Spanish Airlines).*

(3) *De Havilland "retractable" Heron Series 2 feederliner (Four D.H. Gipsy Queen 30s).*

(4) *Percival Provost T. Mk 1 basic trainer (Alvis Leonides) as now in service with the R.A.F.*

4



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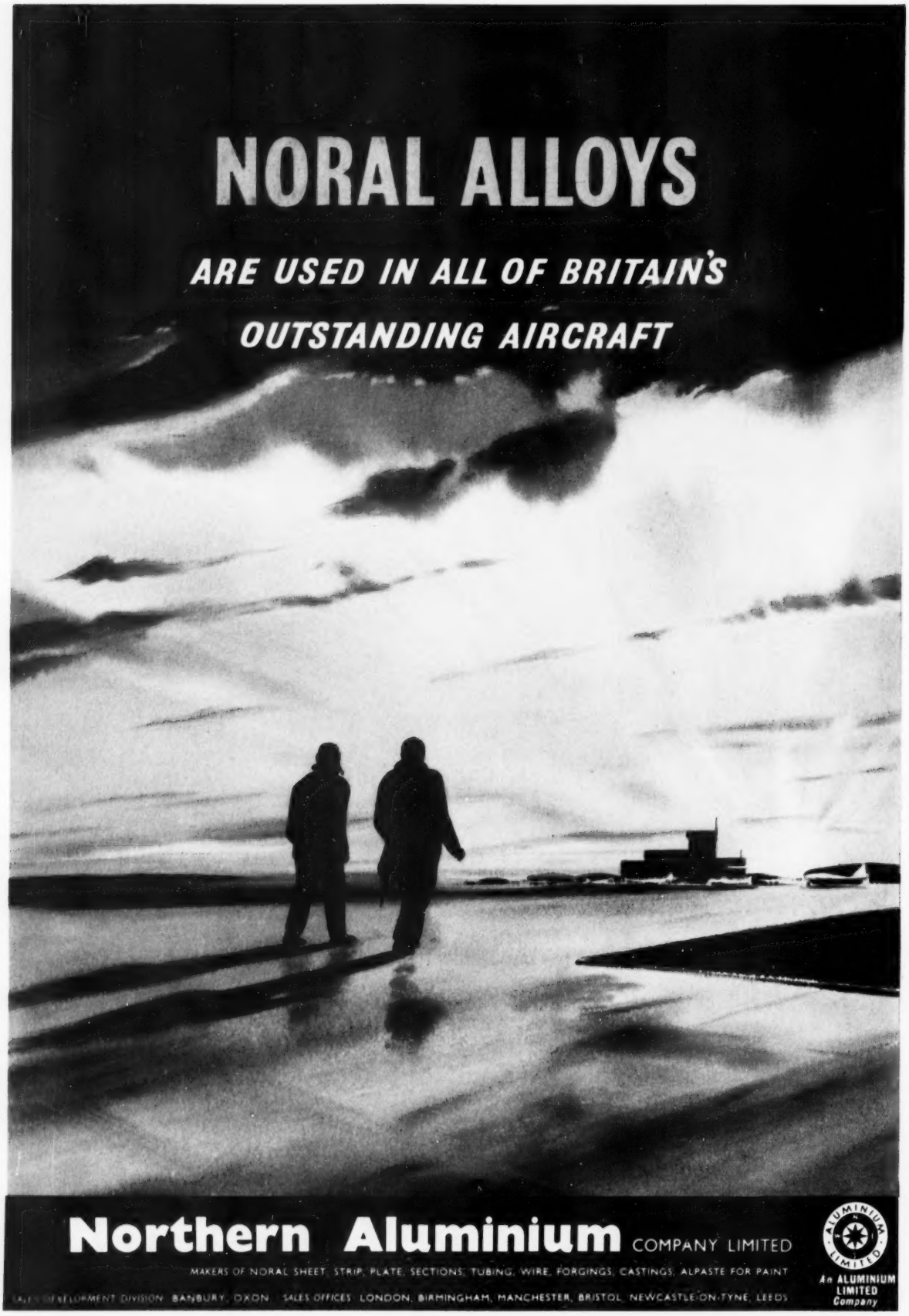
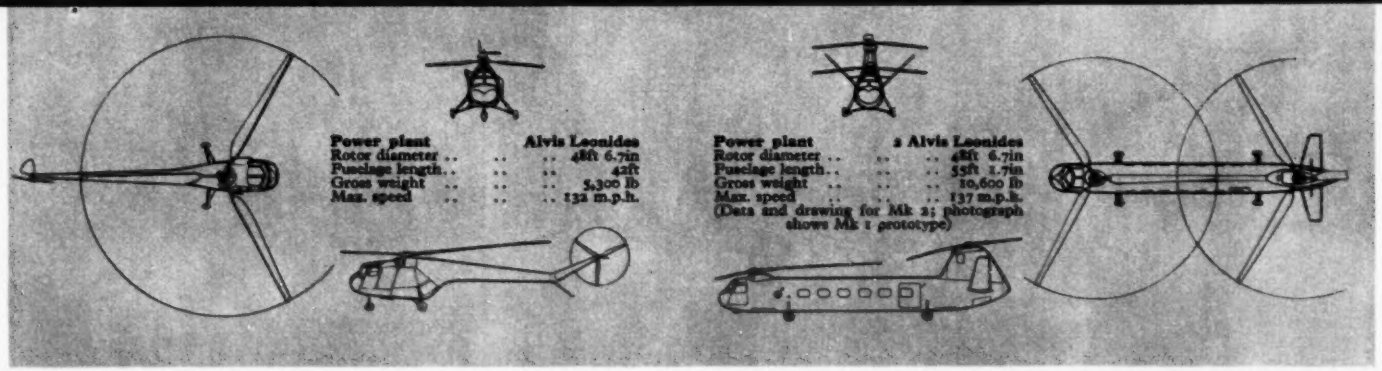
6

(5) *Hawker Hunter F. Mks 1 and 2 fighters (Rolls-Royce Avon, left; Armstrong-Siddeley Sapphire, right) as ordered for the Royal Air Force.*

(6) *Bristol Type 175 Britannia airliner (four Bristol Proteus 3s with D.H. airscrews) as ordered by B.O.A.C.*

Colour supplement continued later in section.


NORAL ALLOYS
ARE USED IN ALL OF BRITAIN'S
OUTSTANDING AIRCRAFT
Northern Aluminium COMPANY LIMITED
MAKERS OF NORAL SHEET, STRIP, PLATE, SECTIONS, TUBING, WIRE, FORGINGS, CASTINGS, ALPASTE FOR PAINT
SALES DEVELOPMENT DIVISION BANBURY, OXON SALES OFFICES LONDON, BIRMINGHAM, MANCHESTER, BRISTOL, NEWCASTLE-ON-TYNE, LEEDS
ALUMINIUM LIMITED
An ALUMINIUM LIMITED Company


Power plant Alvis Leonides
Rotor diameter 48ft 6.7in
Fuselage length 42ft
Gross weight .. .. .. 5,300 lb
Max. speed .. .. .. 132 m.p.h.
Power plant 2 Alvis Leonides
Rotor diameter 48ft 6.7in
Fuselage length 55ft 1.7in
Gross weight .. .. .. 10,600 lb
Max. speed .. .. .. 137 m.p.h.
(Data and drawing for Mk 2; photograph shows Mk 1 prototype)

Bristol 171

EQUIPPED to carry a pilot and four passengers, the Bristol 171 Mk 3A has recently earned the distinction of being the first British helicopter to enter airline service. Two are being used by B.E.A. on regular cargo flights, and passenger services are imminent—including, possibly, a shuttle service between London Airport and the Waterloo Air Terminal. Military versions, differing in detail fittings but having in common the name Sycamore, are serving with the Army, R.A.F. and Royal Australian Navy. Civil and military models alike are powered by the reliable Alvis Leonides (550 h.p.), which gives a cruising speed of 106 m.p.h. and initial rate of climb of 1,000ft/min. A slightly lower cruising speed of 91 m.p.h. gives the best range performance—270 miles at sea level on 65 gallons of fuel with a payload of over 700 lb. High rotor-speed is an important feature of the Bristol 171: the kinetic energy thus stored in the blades is a safeguard against the effects of engine failure, whatever the height or aircraft-speed. Flight instruments are driven off the main rotor, and would continue to function in the event of engine failure.

Bristol 173

THE success of preliminary tests with the prototype 173 is starting to reward Bristol's ambitious attempt to produce a helicopter possessing real "airliner" characteristics. These include comfortable seating for 13 passengers and the reassuring knowledge that sustained flight is possible in the event of complete failure of one engine. A synchronizing shaft between the two 550 h.p. Alvis Leonides ensures that both turn at the same speed and enables one engine to drive both rotors if the other fails. Like the 171, the bigger helicopter has a high rotor speed; it is capable of full autorotation with both engines out. Apart from possible military applications, the Type 173 is likely to be used extensively by B.E.A. as part of the airline's long-term development programme. After tests with the second prototype Mk 2, B.E.A. hope to introduce a small number of Mk 3s powered by 870 h.p. Leonides Majors and fitted with stub wings to relieve rotor-load (and thus increase cruising speed from 113 m.p.h. to nearly 140 m.p.h.). Carrying 14 passengers and baggage, this version would be capable of operating a 190 mile stage-length.

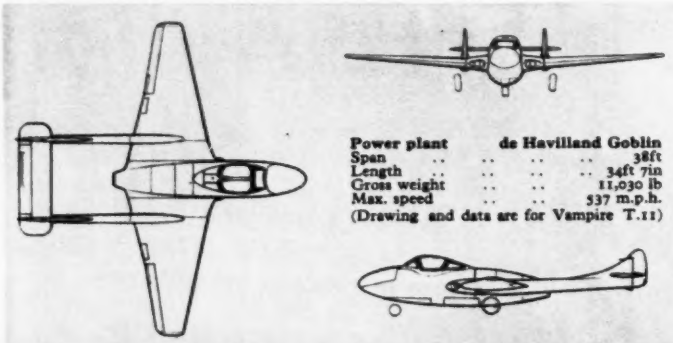
De Havilland Vampire

OF the numerous Vampire variants, interest now centres on the Vampire Trainer ordered in impressive quantities for several air forces, including the R.A.F. The essential features of this aircraft—notably the side-by-side seating for instructor and pupil—are already familiar to Farnborough-goers, but recently-incorporated modifications are as yet little known. The most important of these is the fitting of Martin-Baker fully automatic ejector seats and a new canopy, the latter containing far less metal than formerly and thus improving vision. Another major modification concerns the tail, the fin surfaces of which have been increased in area, permitting rudder travel (formerly restricted due to a slight tendency towards rudder overbalance) to be increased and rendering spin recovery completely satisfactory. In R.A.F. service the Trainer bears the designation Vampire T.11. The Vampire Night Fighter, which is very similar in layout, is the N.F.10. Single-seat Vampire fighter/bombers include the R.A.F. Mks 5 and 9, the Australian Mk 30, Swedish Mk 50, French Mks 51 and 53, and Norwegian Mk 52.

De Havilland Venom and Sea Venom

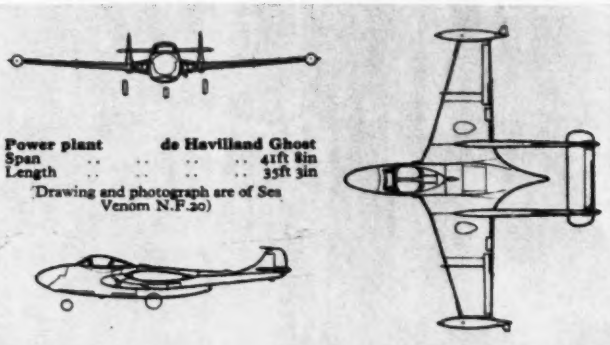
THE Venom is the latest British fighter to enter squadron service with the R.A.F. and, particularly in Germany, is lending new strength to the tactical air forces. Possessing a very high ceiling and good load-carrying ability, it is an excellent dual-purpose machine—equally effective for high-altitude interception and low-level ground attack. Late versions are fitted with ejector seats. The night fighter model now in service is designated Venom N.F.2. In this type the pilot and radar operator are seated side by side behind the nose-mounted radar, and, as in the single-seater, four 20 mm guns are disposed in the bottom of the fuselage. The very latest model—the N.F.3—has the modified tail (first seen on a Sea Venom at the Paris Salon this year) and a frameless canopy. The Fleet Air Arm has adopted a version of the N.F. Venom, suitably fitted with folding wings and an arrester hook (the latter housed in a fairing above and behind the jet-pipe) and known as the Sea Venom N.F.20. All Venoms have boundary-layer fences on the wings and provision for centrally mounted wing-tip tanks. The de Havilland Ghost turbojet is standard.

BRITISH AIRCRAFT 1953



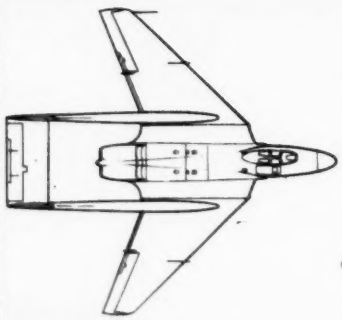
Power plant	de Havilland Goblin
Span	38ft
Length	34ft 7in
Gross weight	11,030 lb
Max. speed	537 m.p.h.

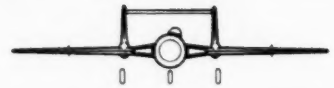
(Drawing and data are for Vampire T.11)



Power plant	de Havilland Ghost
Span	41ft 8in
Length	35ft 3in

(Drawing and photograph are of Sea Venom N.F.20)

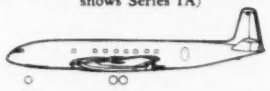


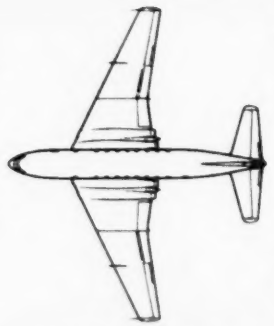


Power plant	2 Rolls-Royce Avons
Span	51ft
Length	52ft

Power plant	4 de Havilland Ghost 50
Span	115ft
Length	93ft
Gross weight	107,000 lb
Cruising speed	490 m.p.h.

(Data and drawing for Comet 1; photograph shows Series 1A)



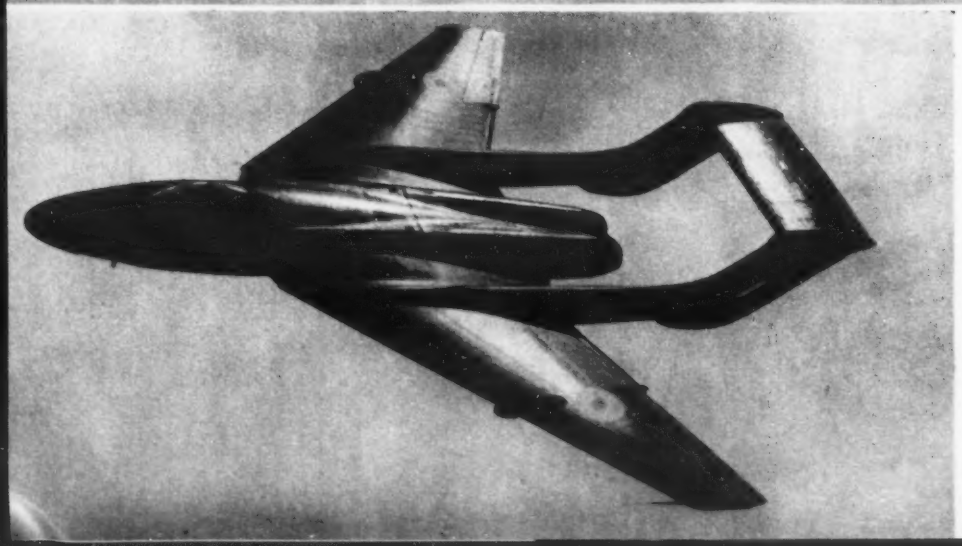


De Havilland D.H.110

THE prototype of this night and all-weather fighter now on test is being developed to meet Fleet Air Arm requirements and will be flying at Farnborough in Naval colours. It may be supposed that folding wings and an arrester hook will be demanded, as on the Sea Venom, though these are not, for the present, installed. The "110" is a machine of exceptional qualities and on very numerous occasions has achieved supersonic speed in a dive. Powered with two Rolls-Royce Avons, fed from wing-root intakes and having provision for afterburners, it has a thin swept wing with pronounced taper, and (somewhat of a surprise to many technicians) retains the characteristic de Havilland twin-boom tail. The tail-plane, it will be noted, has no sweepback, though it is, of course, of very thin section. The pilot's cockpit is offset to port and has a "blister" enclosure; the radio operator is housed to starboard in a cabin, for which windows are provided on the starboard side. Both crew members have ejector seats. The photograph below shows the wing "fences" and the guides for the large-area wing-flaps.

De Havilland Comet 1

NEARLY 28,000 passengers were carried by B.O.A.C. Comets in the first year of scheduled operations. When this historic period ended on May 1st the world's first jet-airliner operators were able to announce that their unique experience of Comet operations had been acquired at a profit sufficient to cover interest on capital. In addition to the B.O.A.C. fleet of eight Ghost-powered Comets, six have been delivered to French operators (U.A.T. and Air France) and two to the R.C.A.F. Although Series 1 and 1A production is now completed, these aircraft have achieved a revolution in air transport by virtually doubling normal operating speeds without economic penalty. The 5,000 lb thrust Ghost turbojets, which are estimated to require only half the maintenance time of conventional power-units, give the Comet a cruising speed of 470-490 m.p.h. at its operating height of 40,000ft. The average stage-length flown by B.O.A.C.'s Comets is in the region of 1,000 miles (the longest is Rome-Beirut, 1,421 miles), but the Comet 1A, with kerosine capacity raised from 6,000 to 7,000 gal, can tackle longer hauls. Passenger capacity varies from 36-44.



De Havilland Comet 2 and 3

TEN major airlines have so far placed orders for these later versions of the Comet, which have longer fuselages to take advantage of the greatly increased performance stemming from the installation of four Rolls-Royce Avon turbojets. Increased fuel capacity, coupled with lower consumption, will give the new Comets more competitive range than the pioneering Ghost versions. Production of the Comet 2, 3ft longer than the Series 1 and capable of carrying 44 passengers on stage-lengths exceeding 2,000 miles, is under way at Hatfield, Belfast and Chester; the first of 12 for B.O.A.C. has already been completed. Other companies with Comet 2s on order include Air France, U.A.T., B.C.P.A., Japan Air Lines, L.A.V. and Panair do Brasil. The theme of Comet development is the improvement of range and payload rather than speed, and the intended cruising speed for both the new versions falls comfortably short of the critical drag-rise speed (some 540 m.p.h.) for the basic Comet airframe. Further lengthened by 15ft is the Comet 3 (on order for B.O.A.C. and P.A.W.A.), a 58/76-seater for stage lengths of up to 2,600 miles.

De Havilland Dove

UPWARDS of £9m, mostly in foreign currency, has been earned since 1946 by sales of de Havilland Dove feederliners. Some 450 have been built, making this attractive twin the most numerous of Britain's post-war transport types. Many are used for executive travel in the United States, where the makers have established a special distribution and after-sales service. The current standard version, the Series 5, is powered by two 380 h.p. Gipsy Queen 70 Mk 2 geared and supercharged engines, and has accommodation for up to 11 passengers. With these engines, more powerful than those of earlier versions, the all-up weight is increased from 8,500 to 8,800 lb. The take-off performance is lively; under I.C.A.N. conditions the Dove 5 clears 50 ft in 770 yd. With a 1,684 lb payload it will cruise for 500 miles at 179 m.p.h. The Dove can be used not only as a miniature airliner, but also for training, crop-spraying and survey. A military version, the Devon, is also serving in large numbers with the R.A.F. and several overseas air forces at home and abroad, both as a transport and as a radio or navigational trainer.

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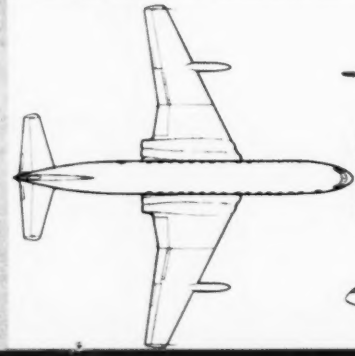
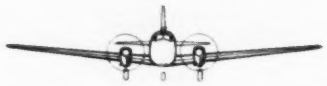
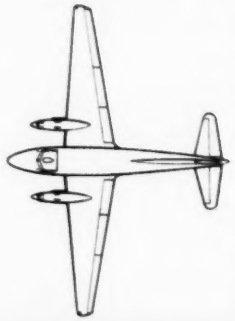


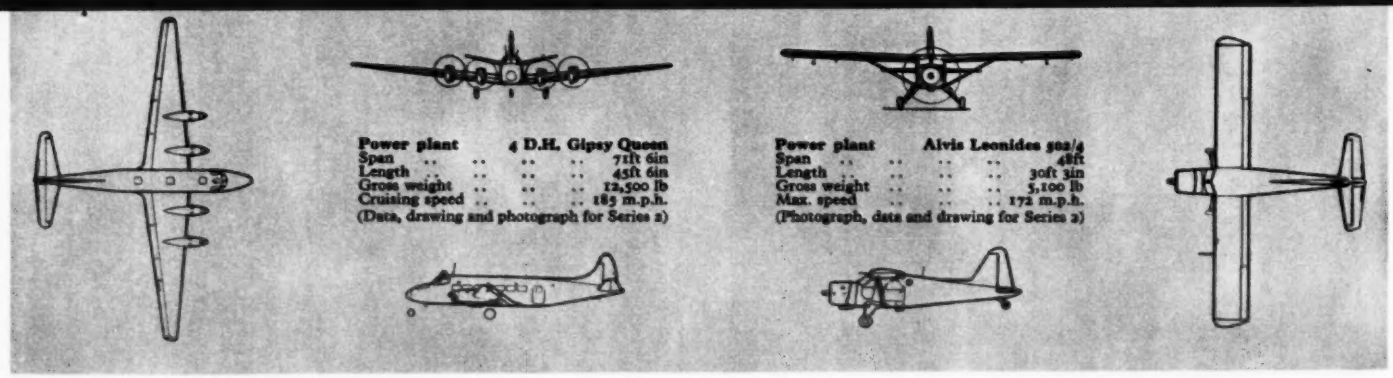
Power plant	**4 Rolls-Royce Avon 500**
Span	115ft
Length	111ft
Gross weight	145,000 lb
Cruising speed	500 m.p.h.

(Data and drawing for Comet 3; photograph shows model of Comet 2)



Power plant	**2 D.H. Gipsy Queen**
Span	57ft
Length	39ft 4in
Gross weight	8,800 lb
Max. speed	210 m.p.h.





Power plant	4 D.H. Gipsy Queen
Span	71ft 6in
Length	45ft 6in
Gross weight	12,500 lb
Cruising speed	185 m.p.h.

(Data, drawing and photograph for Series 2)

Power plant	Alvis Leonides 502/4
Span	48ft
Length	30ft 3in
Gross weight	5,100 lb
Max. speed	172 m.p.h.

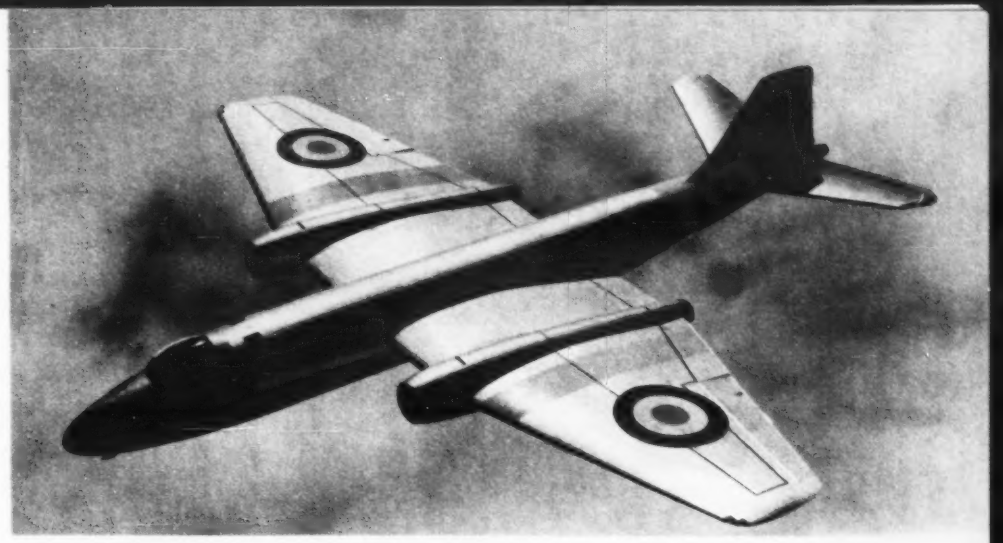
(Photograph, data and drawing for Series 2)

De Havilland Heron

SENSING the need for a simple, economical airliner with a capacity of 14-17 seats, de Havilland developed and produced the Heron as a 100 per cent private venture: no orders had been received when the prototype first flew in 1950. Producton of some 50 Herons for various operators is now well under way (14 had been delivered at the time of writing), and the demand seems likely to continue for several years. Indonesia, France, Japan, Norway, Australia and New Zealand are among the countries where Herons are being or will be used on internal routes; nearer home, one is in service with Airlines (Jersey), Ltd. The Heron 1, with fixed undercarriage, clears 50ft in 685 yd at 12,500 lb gross weight and cruises at 165 m.p.h. Designed for longer stage-lengths, and now in production, the Series 2 has a retractable under-carriage which adds 165 lb to the tare weight but improves cruising speed by 20 m.p.h. Payload/range performance of the two versions differs only slightly; a typical example (Series 1) is 660 miles with 2,400 lb. Both types of Heron are powered by four Gipsy Queen 30 Mk 2s of 250 h.p.

De Havilland Beaver

OVER 500 Beaver bush transports have been produced in the six years which have elapsed since the prototype first flew. Many of these have been L-20 communications versions for the U.S.A.F., although the 500th machine was actually delivered to a civil customer—the Government of the Falkland Islands. Further Beaver orders seem certain. In recent months, de Havilland (Canada) have evolved the more powerful Series 2 (as illustrated), which has a 550 h.p. Alvis Leonides in place of the standard Wasp Junior of 450 h.p. The improvement in performance is shown by the following comparative data (Series 2 figures in brackets): take-off to 50 ft, 910 ft (700 ft); cruising at 75 per cent power, 141 m.p.h. (155 m.p.h.); landing over 50 ft, 999 ft (760 ft). These figures refer to military versions at weights of 4,900 lb (Series 1) and 4,950 lb (Series 2), with each type carrying a 1,000 lb payload. Present maximum weight approved for both types is 5,100 lb. Endurance, with allowances, is over 6 hr with a 1,000 lb payload. The Beaver's normal complement is a pilot and six passengers. Wheels, floats or skis are optional.



De Havilland Chipmunk

THIS is a design of de Havilland's Canadian subsidiary, and is already several years old. In service with the R.A.F.— in the United Kingdom and overseas—and with the air forces of many foreign nations it has proved itself a worthy successor to the Tiger Moth biplane. An all-metal, tandem two-seater monoplane with fixed undercarriage, powered by a Gipsy Major engine, it has flaps, V.H.F. radio, full blind-flying panel, two-stage amber equipment, a cartridge starter, and night-flying lights. Pilots who have converted to it from the "Tiger" have welcomed particularly the enclosed cockpit, greatly improved performance and superior handling qualities, and the increased scope of training thereby offered. Yet, despite its comprehensive equipment, the Chipmunk is delightful to handle, has an initial climb of over 1,000 ft/min, and maintains altitude during continuous aerobatics. A Canadian-built version has a clear-vision "bubble" cockpit canopy. The standard Chipmunk T.10, as in service with the R.A.F., is fitted with a Gipsy Major 8 engine.

English Electric Canberra

THE essential characteristics of the remarkable twin-jet multi-purpose Canberra are now well known, not to the technician and enthusiast alone, but, by reason of the numerous record-breaking flights accomplished during the past three years, to the layman also. There are five basic marks—the B.1, the original two-seat light bomber; the B.2, which is the most common version and is a three-seat bomber (it is now in production at four factories in Great Britain); the photographic reconnaissance P.R.3; the dual-control T.4 trainer; and the B.5 target-marker. All these variants have Rolls-Royce Avon turbojets, as has the Australian-built B.20 bomber. For the American B-57A night-intruder development licence-built Armstrong Siddeley Sapphires are specified; the Canberra is also flying in Great Britain with an experimental Sapphire installation and another Canberra flying test-bed has been flown with advanced versions of the Rolls-Royce Avon. One machine, with Bristol Olympus turbojets, achieved the world record height of 63,668ft on May 4th this year. The design "stretch" of the Canberra has not yet reached its limit.

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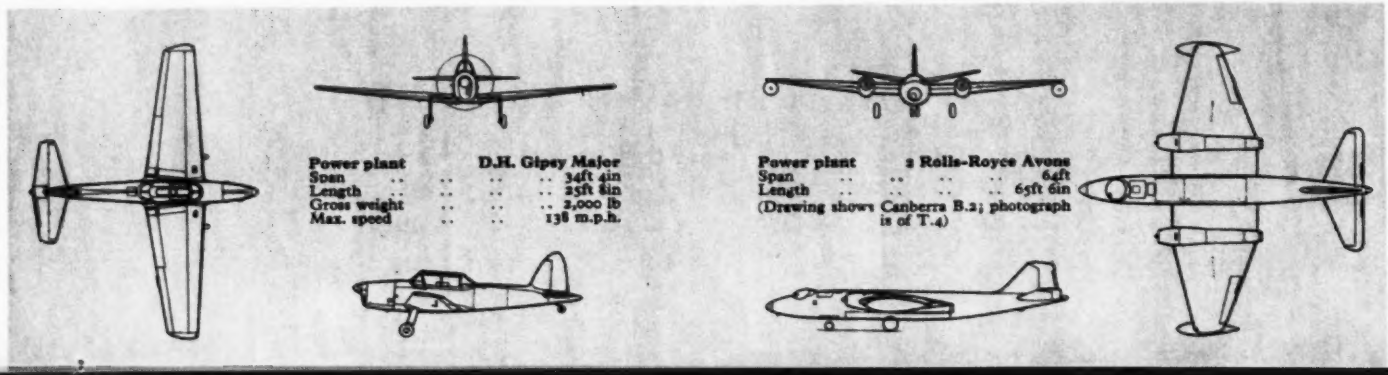
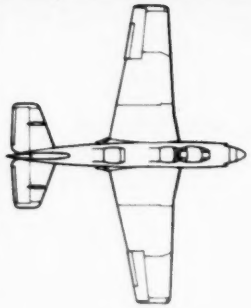
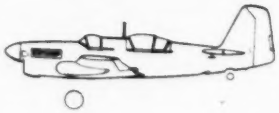
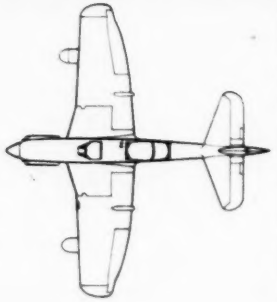

Power plant D.H. Gipsy Major
Span 34ft 4in
Length 25ft 6in
Gross weight 2,000 lb
Max. speed 138 m.p.h.
Power plant 2 Rolls-Royce Avons
Span 64ft
Length 65ft 6in
(Drawing shows Canberra B.2; photograph is of T.4)



Power plant Armstrong Siddeley Double Mamba
Span 54ft 4in
Length 43ft

Power plant Rolls-Royce Griffon
Span 44ft 6in
Length 38ft 3in
(Photograph and drawing show A.S.7)



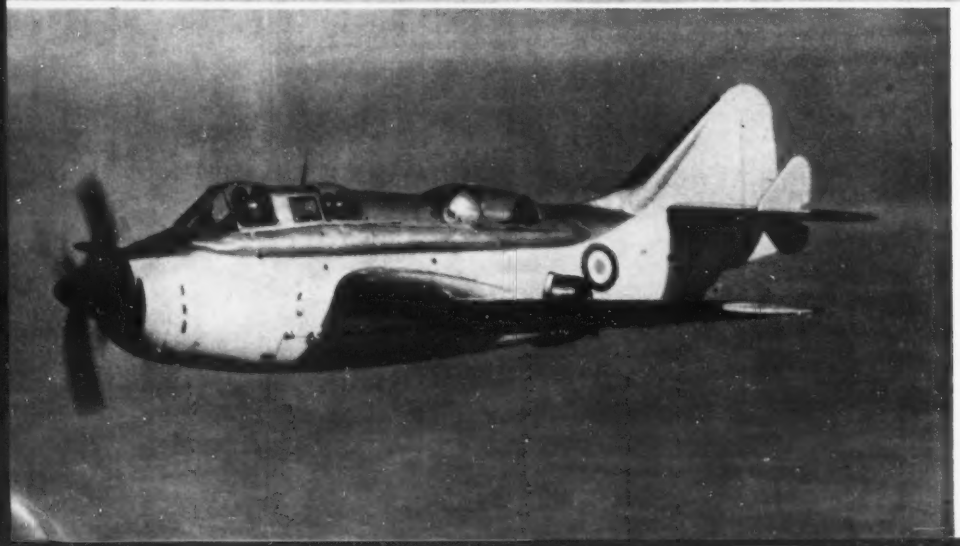


Fairey Gannet

PRODUCTION of this carrier-borne anti-submarine aircraft for the Fleet Air Arm, under the designation Gannet A.S.1, is now well under way, and one of the first machines to leave the production line will be demonstrated at Farnborough. The design of the Gannet abounds in unusual features but principal among these is the installation of an Armstrong Siddeley Double Mamba turboprop. From the Naval standpoint this offers several advantages, first, perhaps, that it avoids the necessity for having to carry petrol on the aircraft carrier. Operationally a very significant factor is the ability of the Gannet to cruise on one "half" of the engine, reserving full power for take-off, the actual strike, and emergency. A three-seater, the Gannet has frequently been demonstrated at speeds estimated by observers to be over 300 m.p.h. and has displayed a high degree of manœuvrability. Features which also attract notice on these occasions are the capacity of the weapons bay and the retractable radar housing, which is mechanically lowered astern of the rear cockpit.

Fairey Firefly

DATING as it does from the late war years, the Firefly has a long record of development and achievement behind it. Originally classified as a deck-landing fighter/reconnaissance machine, it has latterly been developed for anti-submarine work and for training. Variants warranting mention here are the A.S.6, equipped for anti-submarine duties and having no gun armament; and the A.S.7, with redesigned wings and engine installation, accommodation for a crew of three, radio and radar equipment appropriate to anti-submarine detection, and a revised tail. The existence has recently been made known of the T.7, which is a trainer adaptation of the A.S.7. All Fireflies are powered by a Rolls-Royce Griffon engine. The A.S.7 carries sonobuoys in special aerofoil section containers beneath the wings, and its offensive armament may include rocket projectiles. Early marks of Firefly have been very successfully converted not only for training but for target-towing at speeds approaching 300 m.p.h.



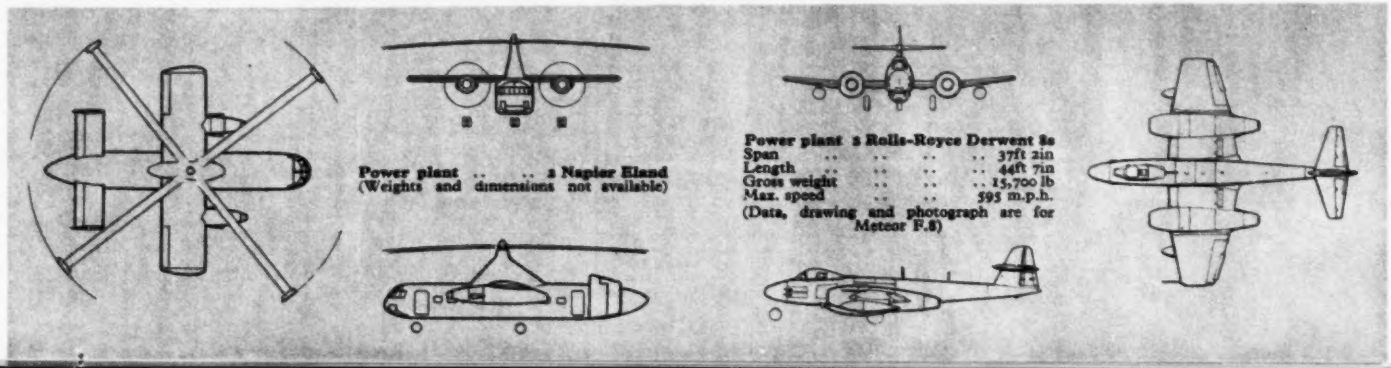
Fairey Rotodyne

THE Fairey Rotodyne, a prototype of which was ordered last July by the Ministry of Supply, is a design in the convertiplane class. Following broadly the principles of the earlier Gyrodyne, the Rotodyne obtains lift for vertical ascent from a tip-jet-driven rotor of some 100ft diameter, while in forward flight propulsion effort is progressively transferred to two airscrews driven by two Napier Eland turboprop units. Lift in this flight condition will be obtained from the wing and conventional control surfaces will be used; the rotor, now autorotating, supplying about half the lift. This system results in an aircraft capable of vertical ascent and descent and yet also of a fairly high cruising speed. The Rotodyne will prove most valuable for both civil and military applications. The Eland is of small dimensions, but gives high power and has low consumption. In civil form, the Rotodyne will carry between 30 and 50 passengers or equivalent freight and provide full twin-engined safety. The first prototype is due to fly in two years' time.

Gloster Meteor

IN its nine years of service the Meteor has passed through numerous variations—and the many R.A.F. marks do not represent by any means the total. Versions principally in use are the T.7 trainer, F.8 intercepter, the F.R.9, for fighter reconnaissance, the P.R.10 for photographic reconnaissance, and the N.F.11 night fighter. Most of these have been sold, or constructed under licence, abroad. In its day a fighter of the first rank, the Meteor single-seater is now outclassed by established foreign types, and R.A.F. squadrons eagerly await replacements from Britain's new crop of sonic intercepters. Yet in Korea the F.8, armed with rocket projectiles in addition to its four 20 mm guns, proved itself to be a ground-attack aircraft of exceptional qualities, capable of delivering its load with great accuracy and, thanks to its ability to take punishment, in relative safety. A special "private-venture" ground-attack Meteor has already been displayed at Farnborough. In the trainer field the T.7 continues to provide a most valuable introduction to jet flying.

BRITISH AIRCRAFT 1953


Power plant .. .. 2 Napier Eland
(Weights and dimensions not available)
Power plant 2 Rolls-Royce Derwent 8s
Span 37ft 2in
Length 44ft 7in
Gross weight .. .. .. 15,700 lb
Max. speed .. .. 595 m.p.h.
(Data, drawing and photograph are for Meteor F.8)

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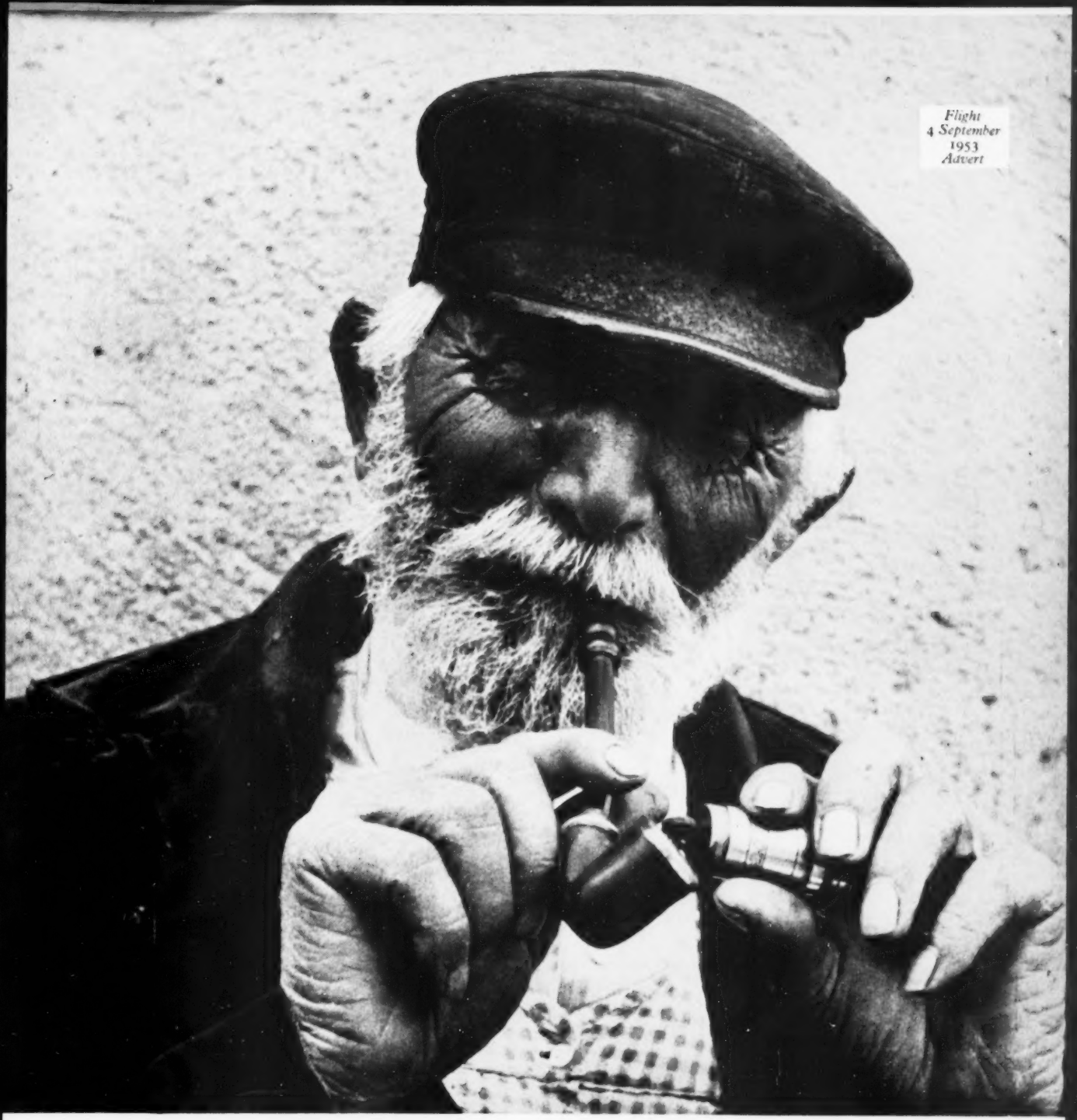

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1953
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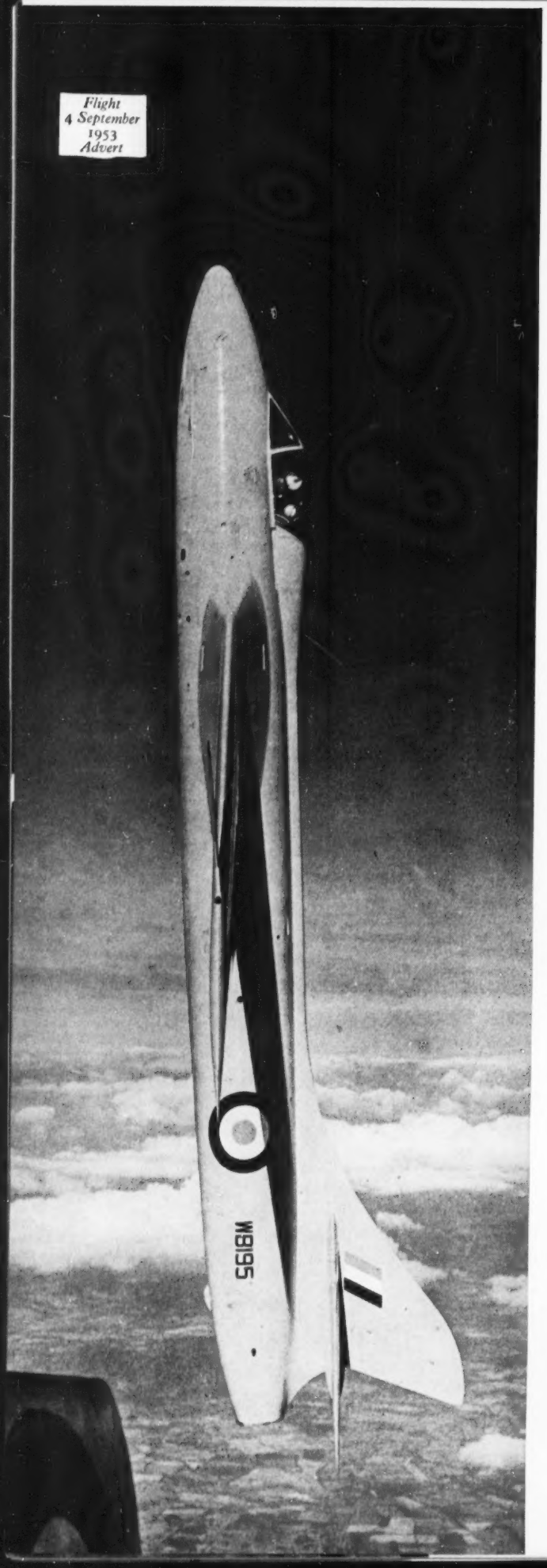

HAWKER HUNTER SOON IN SQUADRON SERVICE

First choice of the Royal Air Force, first choice of NATO, the Hunter is now revealed as a wellnigh flawless, "bugless" aircraft. This superb interceptor, the "finest fighting aircraft in the world," has passed all its flight trials, justifying every possible expectation. Supersonic, heavily armed, extremely manoeuvrable—the fighter pilot's ideal machine—the Hunter, shown left in a vertical climb, is now coming off the production lines at Kingston and at the mammoth new Squire's Gate factory at Blackpool. First it will be moving into squadron service with the R.A.F. and rapidly thereafter with NATO.

$182,000,000 NATO ORDER

After stringent evaluation trials, the Hunter was chosen by NATO as first-string fighter. In a record-breaking off-shore purchase, the United States Air Force placed an order for 182 million dollars with production scheduled at Hawker's in the U.K. and under licence in Holland and Belgium. There can be no more tangible proof than this of the Hunter's superiority.

TEST PILOT CHECK. Hawker's Neville Duke shows the Hunter cockpit layout to USAF Colonel Fred Ascani, American Evaluation Test Pilot, during NATO flight trials.

FINEST IN WORLD. This in-flight Hunter photo demonstrates the beautifully clean lines of Hawker's superb interceptor, chosen both by RAF and NATO as first-string fighter.

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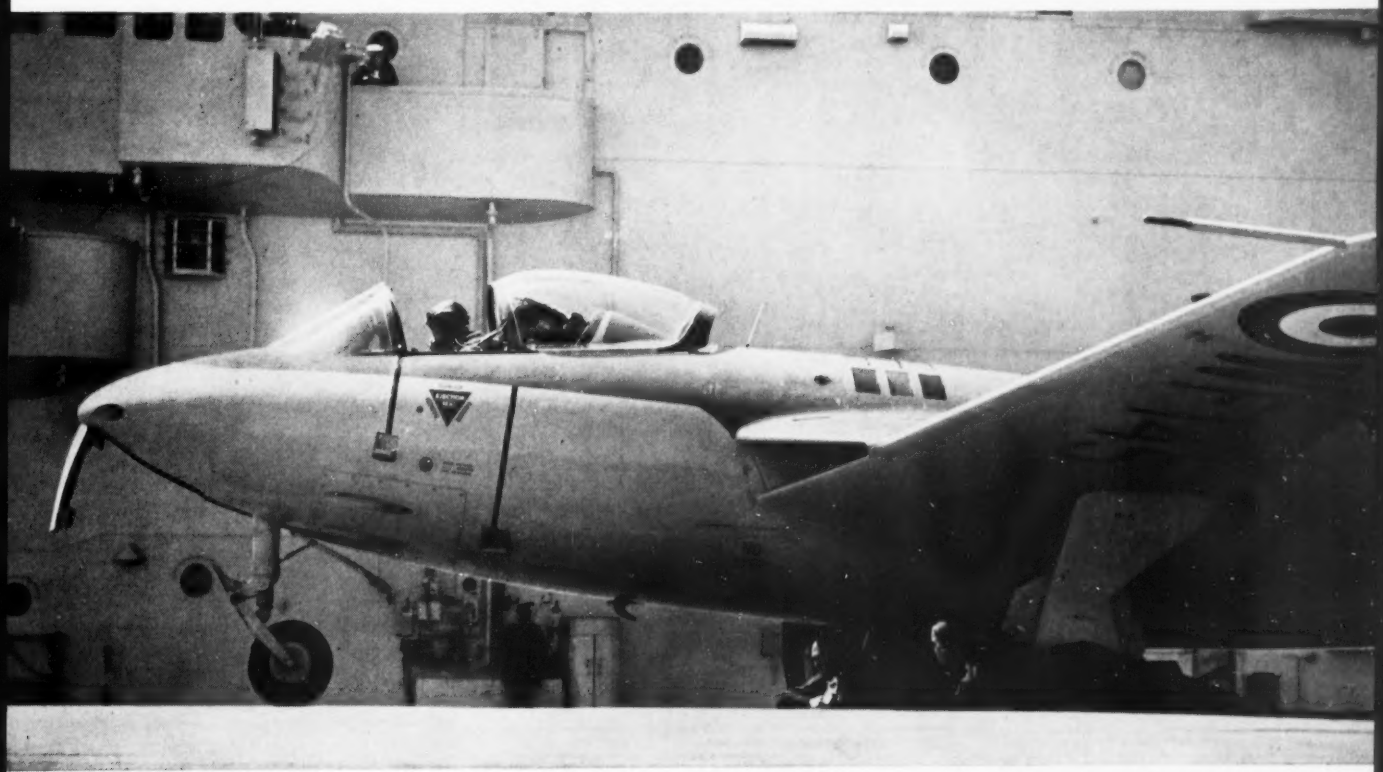
ARMSTRONG WHITWORTH DELIVERS SEA HAWKS TO ROYAL NAVY

The Sea Hawk, Hawker-designed first line jet fighter for the Fleet Air Arm, is now rolling off production lines at Baginton, following a Group production switch last Spring from Kingston. First deliveries have already been made to naval squadrons. In addition to orders for the Royal Navy, American off-shore contracts running into many millions of dollars have been placed with AWA.

The air umbrella for night fighter defence of Western Europe was considerably strengthened during the year with deliveries of Armstrong Whitworth radar equipped Night Fighters. These versatile aircraft are now in service with the R.A.F., French, Belgian and Danish air forces.

In August, Armstrong Whitworth completed the Group's trans-sonic wind tunnel. This important research development will be shared by all Group units. Later this year, Armstrong Whitworth will complete a supersonic wind tunnel — largest facility of its kind undertaken by private enterprise.



NAVAL PILOTS ENJOY SEA HAWK. Take-offs and landings are easy from Royal Navy Carriers with the Sea Hawk. This primary strike fighter is exceptionally docile. It is highly manoeuvrable, heavily armed, and handles easily.

ARMSTRONG WHITWORTH NIGHT FIGHTERS now in squadron service with the RAF and NATO countries form Europe's dependable and versatile night umbrella.

FOUR FLEET AIR ARM SEA HAWKS in beautiful formation are shown here carrying the insignia of 806 Squadron. U.S. off-shore deliveries are now scheduled.

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AVRO CANADA DOES 100% JOB AHEAD OF SCHEDULE ON CF 100 MARKS 3 AND 4!

A. V. Roe Canada, founded in 1945, is the youngest member of the Hawker Siddeley Group, yet already belongs to that exclusive fraternity of aircraft manufacturers who design, develop and produce both airframes and engines.

In two of the most modern production facilities anywhere, covering a total of nearly 3,000,000 square feet on 350 acres at Malton, Ontario, some 14,000 Canadian workmen are making a significant contribution to the defence of the free world by producing the CF 100 long-range all-weather interceptor, now in squadron service with the RCAF, and the Orenda gas-turbine for installation in the CF 100 and for the F 86 Sabre.

Avro Canada recently completed, ahead of schedule, its production contract for the Mark 3 version of the CF 100 and the first of the improved rocket-firing supersonic Mark 4 are now coming off the Malton production lines.

A Canadian-built, Orenda-powered Sabre, flown by Miss Jacqueline Cochran, now holds all but one of the principal aircraft speed records for straightaway and closed-course flights.

DOWN IN A BREATH-TAKING DIVE goes the CF 100 all-weather fighter, specially designed for Canada's defence under Arctic conditions.

NEW ORENDA ENGINE PLANT, shown in foreground, lies adjacent to Avro Canada aircraft factory (top right) at Malton, next to Toronto airport.

LONG RANKS OF ORENDA ENGINES at Malton being readied for shipment to RCAF bases in Canada for CF 100's, to Montreal for F 86 Sabres, and to NATO bases in U.K. and continent.

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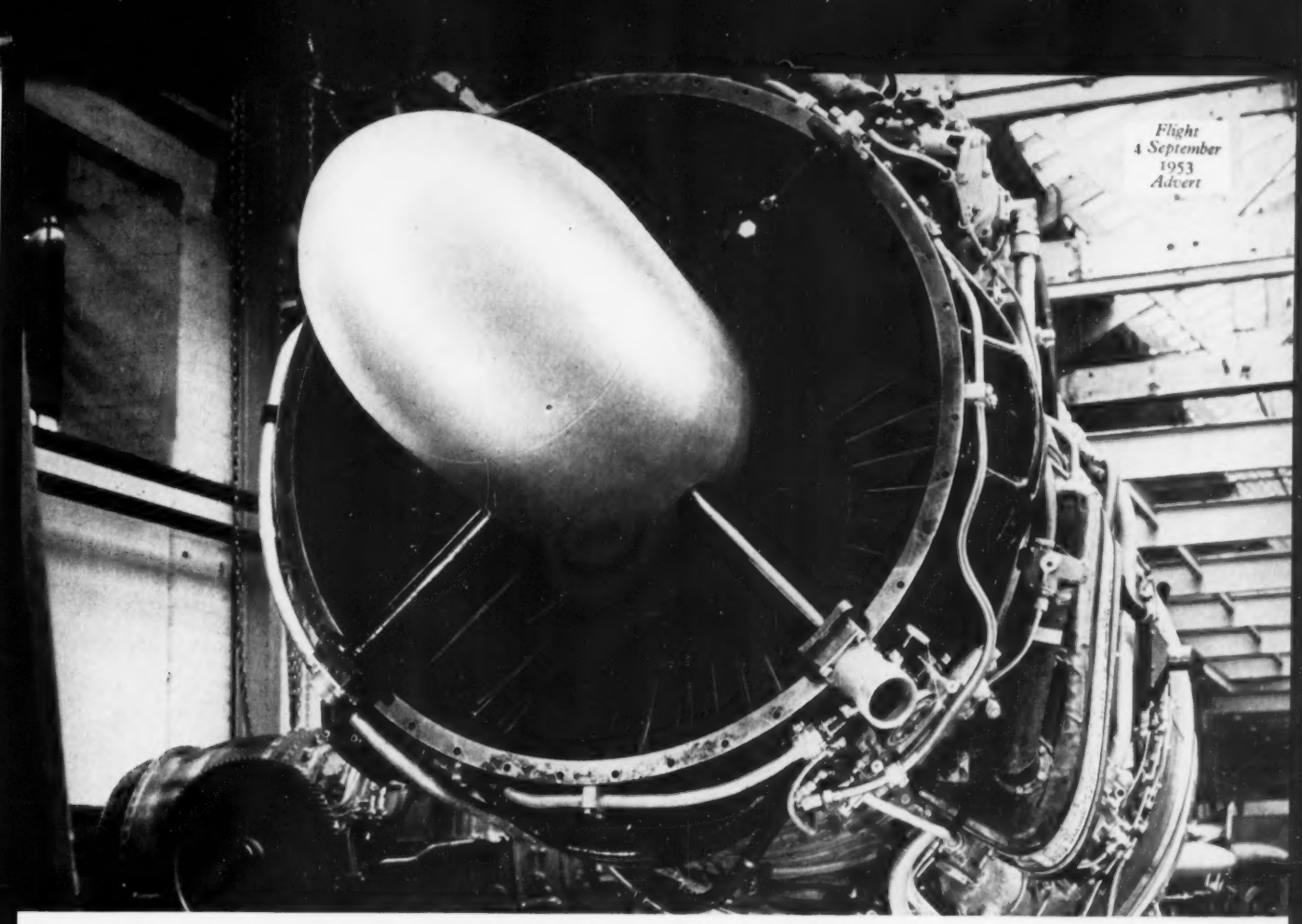


SAPPHIRE IS WORLD LEADER. The Armstrong Siddeley turbo-jet retains its title with 8300 lbs. thrust as the world's most powerful type tested engine now in full scale production in both U.K. and U.S.A. for super priority aircraft. Among Sapphire's best qualities is development potential.

SAPPHIRE PRODUCTION SPEEDED AT FOUR PLANTS BY ARMSTRONG SIDDELEY

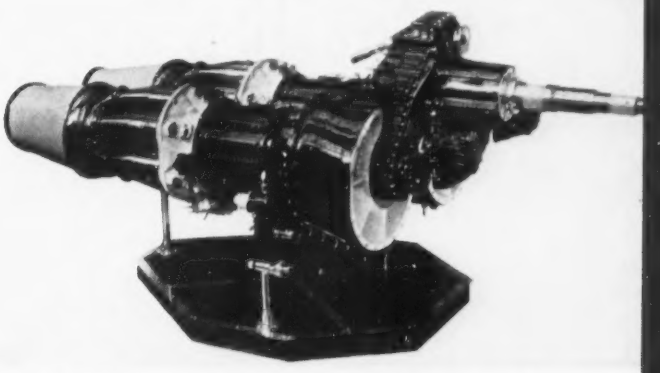
Four separate factories and research stations are now speeding production of the world famed Sapphire turbo-jet, the latest and the largest being at Brockworth in Gloucestershire.

Super priority orders call for the installation of this Armstrong Siddeley leader in the Hawker Hunter F 2, the Gloster Javelin and the Handley Page Victor bomber. Alongside this expansion of production for current aircraft, development work on more powerful Sapphires goes on energetically. Two new versions are announced at Coventry, the SA 4 and the SA 7, but details are still secret.

Moreover, the Sapphire is in full production at Curtiss-Wright in New Jersey, to power the Republic F 84F Thunderstreak and the Martin B 57.

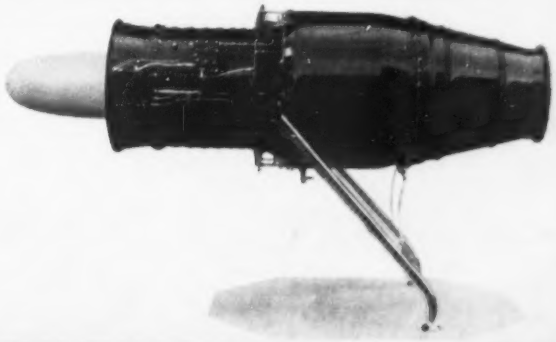
In addition to the Sapphire, ASM is in super priority production with the Double Mamba prop-jet type-tested at 2950 e.h.p. with more powerful versions coming up — the ASMD.3 of 3120 e.h.p. and the ASMD.4, details of which are still secret.

Other Armstrong Siddeley engines are the Viper turbo-jet, chosen by the R.A.F. for its new basic jet trainer, the Percival Provost; the Python in production for the Royal Navy's Westland Wyvern; the Mamba installed in the French Breguet Vultur prototypes; the Adder in the Swedish Dragon Saab 210; the Snarler, first liquid fuel rocket motor to fly.



DOUBLE MAMBA IS SUPER PRIORITY prop-jet for Royal Navy's Fairey Gannet. Great feature is maximum fuel economy.

ASM VIPER HAS TWO FORMS, short life for Jindivik pilotless aircraft and long life for RAF trainer, the Provost.



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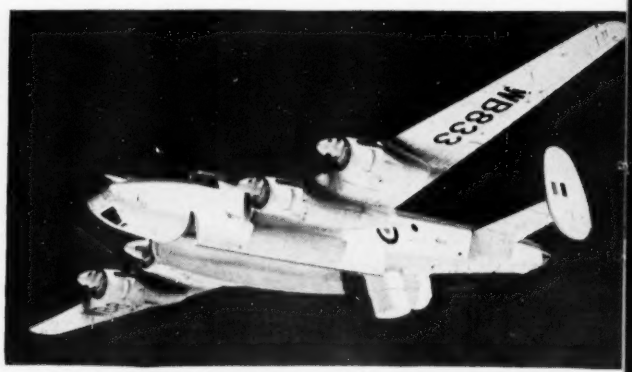
YEARS OF AVRO RESEARCH successfully pioneered the new Delta planform shown strikingly in this magnificent Vulcan bomber now in super priority production for RAF.

ANOTHER NEW CHAPTER IN THE DELTA STORY

Since the dramatic first appearance of the Avro Vulcan last year at Farnborough — in the well remembered red-white-and-blue fly past with the huge new bomber flanked by the smaller research 707s — the Delta wing around the world has become the symbol of tomorrow's air power. This year at Farnborough there are more Deltas, each of them flying proof of the Delta's virtues—aerodynamic and servicing simplicity, great range, high altitude and high speed, fighter-like manoeuvrability, heavy bomb load, easy landing and take-off, exceptional safety and immense development potential.

The Vulcan is now in super priority production for the R.A.F. Hundreds of hours of flight testing, take-offs and landings in all manner of conditions have proved that the Delta planform delivers everything that has been claimed for it. Without any doubt the Avro Vulcan gives the West a long lead in sonic high altitude bombers.

AVRO "ATLANTIC" PROJECT ANNOUNCED for transatlantic Delta airliner. New York/London 6 hours non-stop.



AVRO SHACKLETON MARK II is now in squadron service with Coastal Command. This is world's finest very long range anti-submarine hunter. In full production.

GLOSTER JAVELIN RATED KEYSTONE OF RAF ATOM DEFENCE

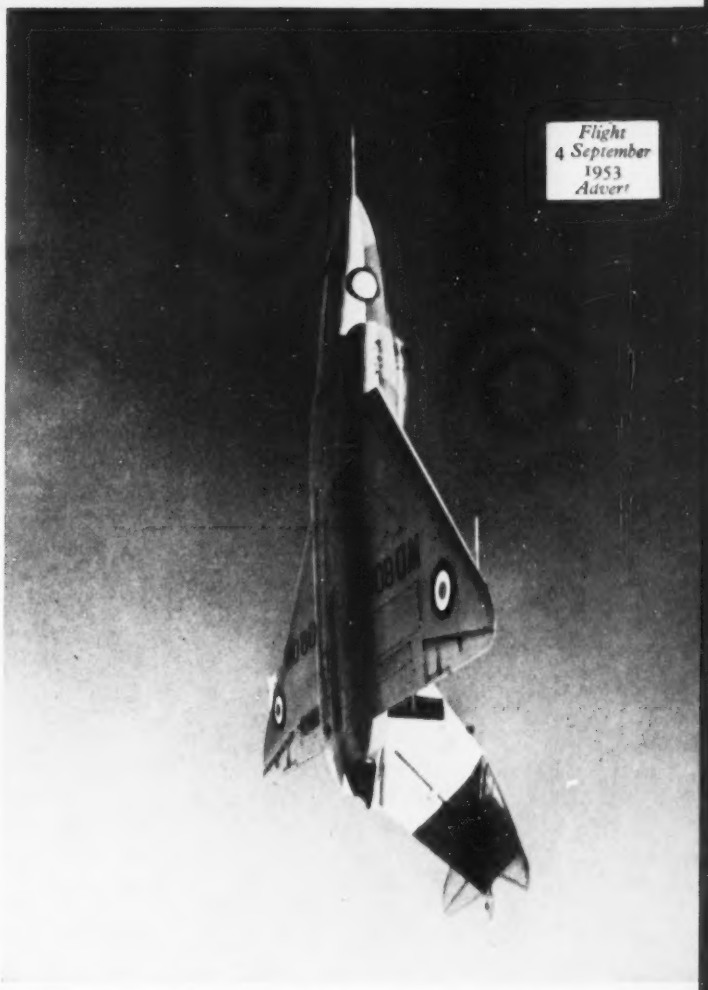
Now in super-priority production at Gloucester, for the R.A.F., the Gloster Javelin is considered to be the vital key in both Britain's and Europe's atomic defence.

With its supersonic capabilities, extensive radar equipment and heavy armament, this twin-jet all-weather Delta fighter is the most formidable aircraft of its type in the world.

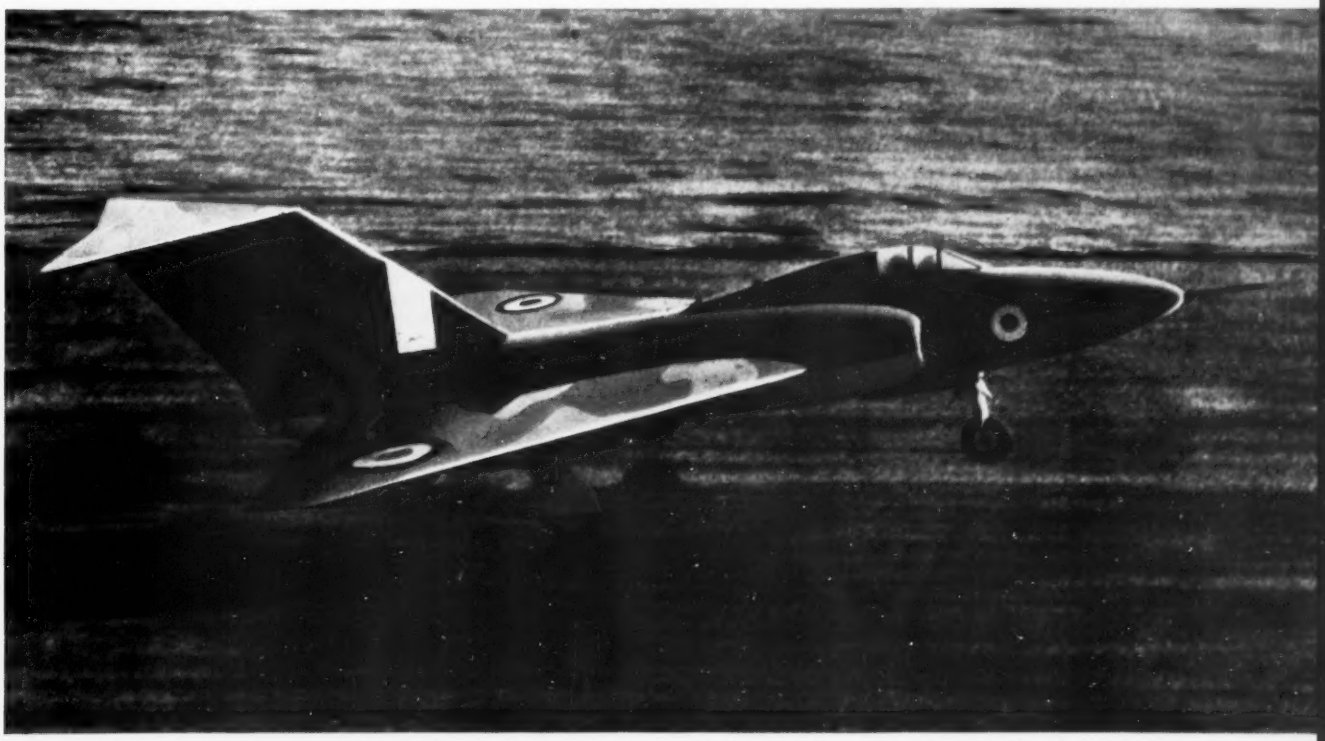
Built by the only aircraft company in the world with more than 14 years continuous experience of jet aircraft design, construction and development, the Javelin is outstanding in every essential requirement. A low wing loading and good power/weight ratio enable this aeroplane to take off from very short runways, then climb steeply and swiftly to its combat altitude. In flight at all altitudes the Javelin possesses exceptional manoeuvring characteristics and docility of control.

On the approach to and during landing, the Javelin pilot retains positive control right to the point of touch down where the wide track undercarriage and powerful brakes ensure a steady run of minimum length.

The development potentialities of the Javelin are great and were undoubtedly a contributory factor in the selection of the aeroplane by the R.A.F. for super-priority production.



STRAIGHT UP AND AWAY Twin Sapphires push Delta Javelin in vertical climb. Planform permits outstanding aerobatic characteristics at very high speeds and altitudes.



LANDING IN A MINIMUM, STANDARD RUN, the Javelin pilot has good forward view, low landing speed and powerful brakes on wide-track undercarriage.

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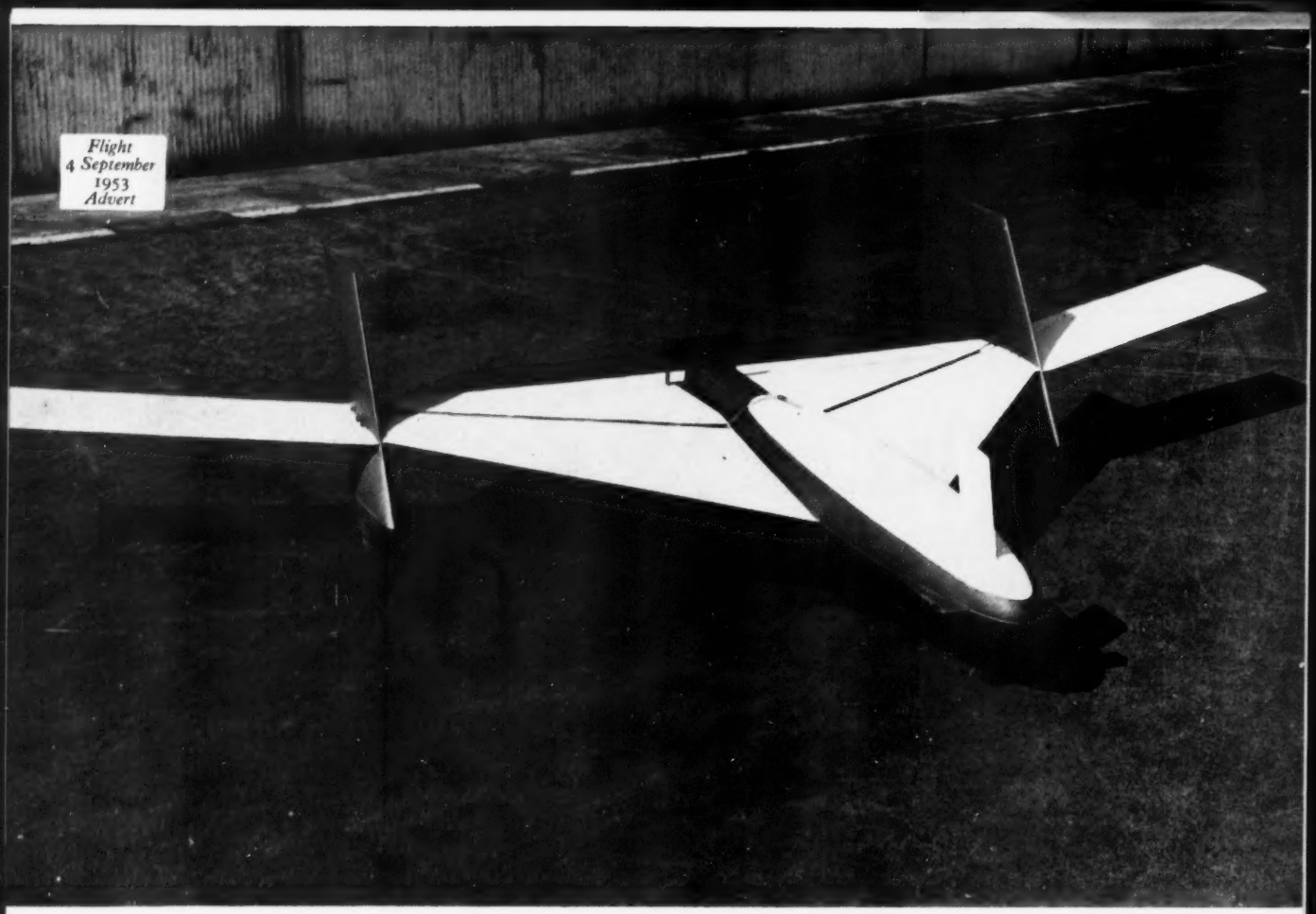


HIGH SPEED TOWED TARGET is new AST development for subsonic and supersonic fire power problems. It is the first of its kind in the world.

TESTS, TARGETS AND TRAINING AT HAMBLE

Aviation Industry Acclaims AST for Specialist Gas Turbine Installations

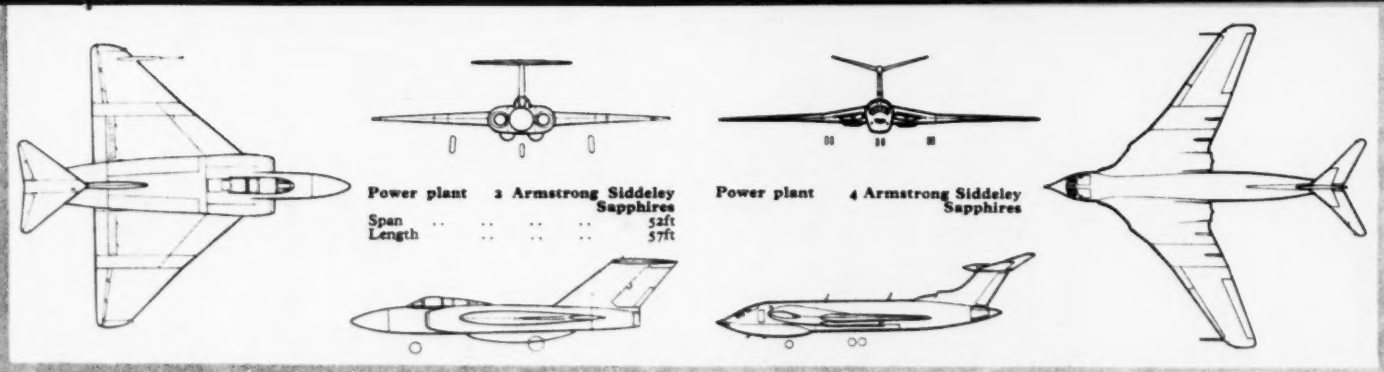
Some of the most important and interesting aeronautical assignments in the world are carried out in the engineering workshops of AST at Hamble, near Southampton.

This important member of the Hawker Siddeley Group carries out repair and maintenance of all types of aircraft, from the smallest land planes to the largest flying boats. It specialises in conversions and modifications as well as in the supply of aircraft equipment. It designs and installs many specialist gas-turbine installations for the Group, for the Ministry of Supply and Foreign Governments.

AST also has its own development unit. The latest product is the new high speed Towed Target, designed to help solve problems of fire power arising from the subsonic and supersonic speeds of modern aircraft. It is the first Towed Target capable of use at highest jet speeds.

Air Service Training's famous flying school, shown on right from the air, is now in its 22nd year. It has trained pupils from 68 countries for all flying and maintenance duties since the establishment began in 1931. There are currently 260 students under training at AST.

INTERNATIONAL AIR UNIVERSITY. AST also conducts world's largest private flying school. Above is a typical group of students, left to right: B. Rusmiputro, Indonesia; A. J. C. Crossley, England; A. Rohim, Indonesia; E. T. Hallac, Transjordan; R. M. A. Sjafei, Indonesia. The Indonesians are some of 25 students now being trained as pilots and navigators for the Indonesian national airline.

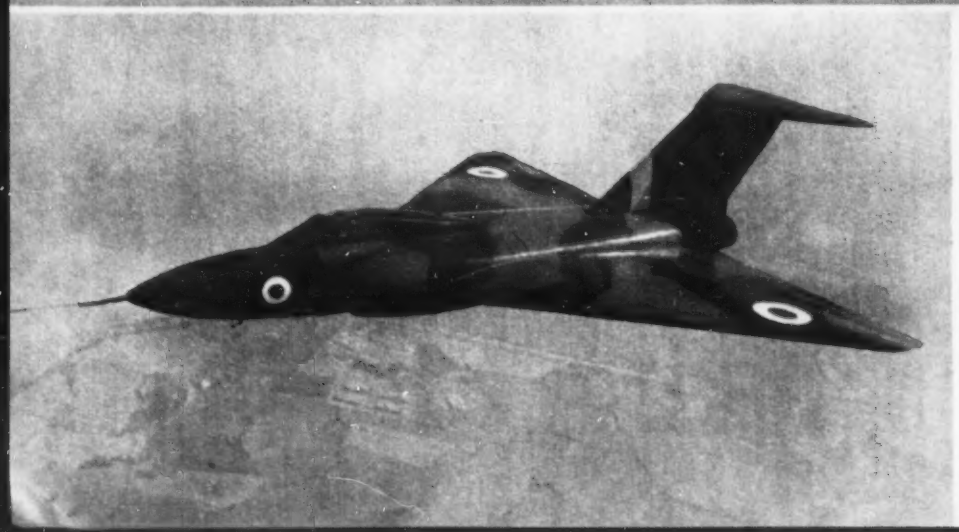


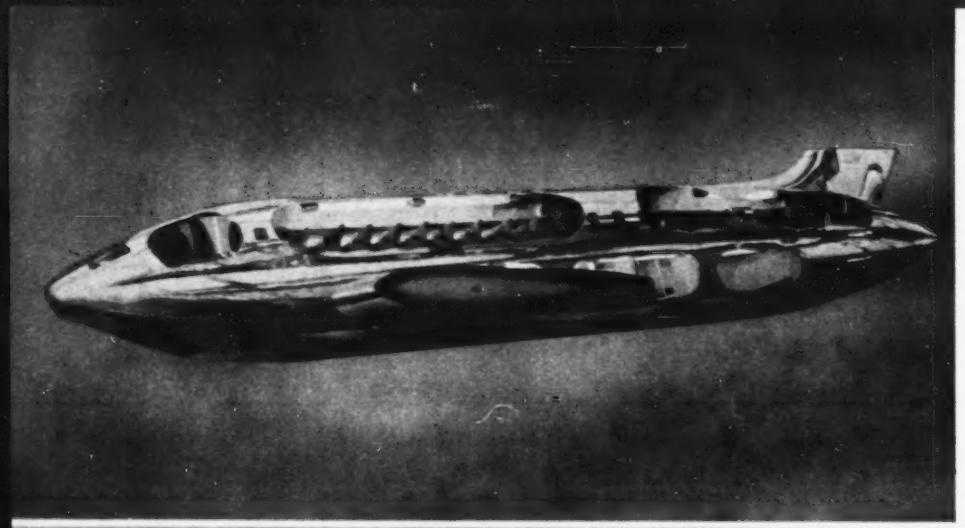
Gloster Javelin

HAVING regard to its heavy armament (the nature of which may not be disclosed) and its comprehensive electronic installations, the Javelin's handling and performance qualities, especially in respect of climb, ceiling, endurance and manœuvrability, are of a quite exceptional order. Classed as a night and all-weather fighter (hence its official designation Javelin F.A.W.1) it has a delta wing of generous area, but retains a more or less conventional tail unit. This helps to ensure that handling characteristics—in the words of the company's chief test pilot—"vary but little from those of any conventional old-type plank-wing aircraft." The two turbojets are Armstrong Siddeley Sapphires and they are disposed in nacelles which abut on the fuselage sides. Evidently this location is favourable to the fitment of afterburners, should these be required. Pilot and radar operator sit in tandem, and ahead of their cockpit enclosure is the main radar installation. During the past year the shape of the nose has undergone some change, and other modifications have been made to the outer wing panels.

Handley Page Victor

POPULAR imagination has been captured by the "crescent" or "scimitar" wing of this, Britain's latest, jet bomber. It was not, however, the aesthetic appeal of this plan form which impelled the Air Staff to order Victors straight "off the drawing-board" for the Royal Air Force; it was (it may be supposed) the very high performance promised thereby. Within the relatively thick, very sharply swept, inboard sections are housed the four Armstrong Siddeley Sapphire turbojets, with two of which experience was gained in a Hastings, and immediately outboard of this section is a somewhat thinner and slightly less swept portion. The extreme outboard panels are very thin indeed, and even less sharply swept. On their leading edges are nose-flaps, of the "droop snoot" variety, which are used for take-off, landing and slow flight; these are independent surfaces and are under the direct control of the pilot. The air brakes, located in the tail end of the fuselage, are two panels of large area and demonstrations suggest that they are extremely effective. The bulge under the fuselage may house a radar scanner.





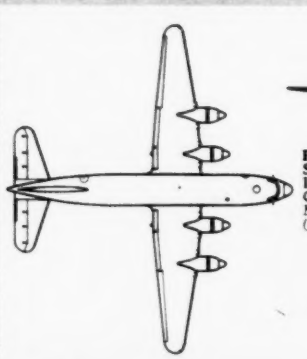
Handley Page Transports

WHEN the Handley Page project for a 150-seat, 600-m.p.h. airliner was announced last year, details of the wing design were not disclosed. Since then the company's Victor bomber has been revealed, and it is reasonable to assume that the new airliner, designated H.P.97, will employ the distinctive crescent plan-form of its military predecessor. The fuselage will be of double-bubble section, with two decks and capacity for 96-150 seats, depending on the standard of comfort offered. On the North Atlantic route, say the makers, the H.P.97 would operate at a direct cost of 1d per passenger mile, covering the 3,450 miles between New York and London twice in a day. Another important project is reported to be on the Handley Page drawing-board: a four-engined, high-wing airliner designed to replace the Dakota. Of this aircraft, said to resemble a larger Marathon with Alvis radial engines, no details have been officially released. The Hermes (below), as operated by B.O.A.C. and Airwork, is a comfortable 40/56-seat transport capable of flying nearly 2,900 miles at 267 m.p.h. with a 6,350 lb payload.

Handley Page Hastings

THE various marks of Hastings may be defined as follows. Hastings C Mk 1 is the original Royal Air Force transport version, powered with Bristol Hercules 101 engines. A structurally similar machine is the Met. 1, equipped for long-range meteorological reconnaissance, but the C.2 differs in airframe and power plant. The engines are Hercules 106s and the tailplane has been lowered to the centre-line of the fuselage and increased in area. Extra fuel tankage and spring tabs on the elevators are additional refinements. The Hastings C.3 was developed for the Royal New Zealand Air Force and uses Hercules 737 engines with single-stage superchargers. Otherwise it is essentially similar to the C.2. The C.4 is a special V.I.P. version with *de luxe* accommodation for four personages and their staff. Four of these machines are being operated by the R.A.F. The Hastings C.2 accommodates 30 paratroops with supplies, 50 fully equipped troops, 32 stretcher cases and 28 sitting wounded, or any of several combinations of freight loads.

BRITISH AIRCRAFT 1953

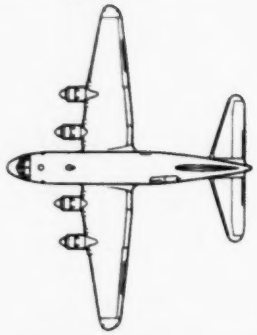


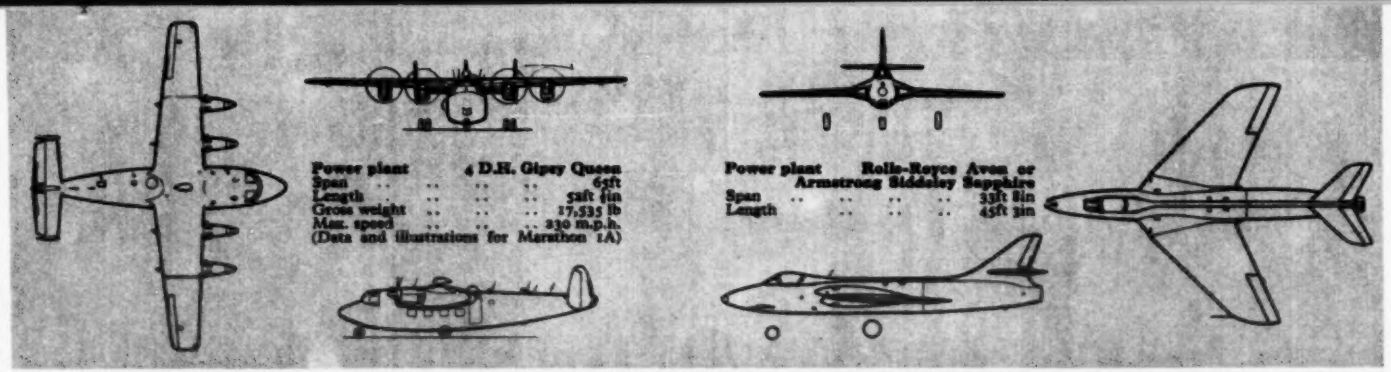
Power plant	**4 Bristol Hercules 773**
Span	113ft
Length	96ft 10in
Gross weight	86,000 lb
Max. speed	357 m.p.h.

(Drawing and data for Hermes IV; illustration shows H.P.97)

Power plant	**4 Bristol Hercules 106**
Span	113ft
Length	82ft 1in
Gross weight	80,000 lb
Max. speed	348 m.p.h.

(Data are for C.2)



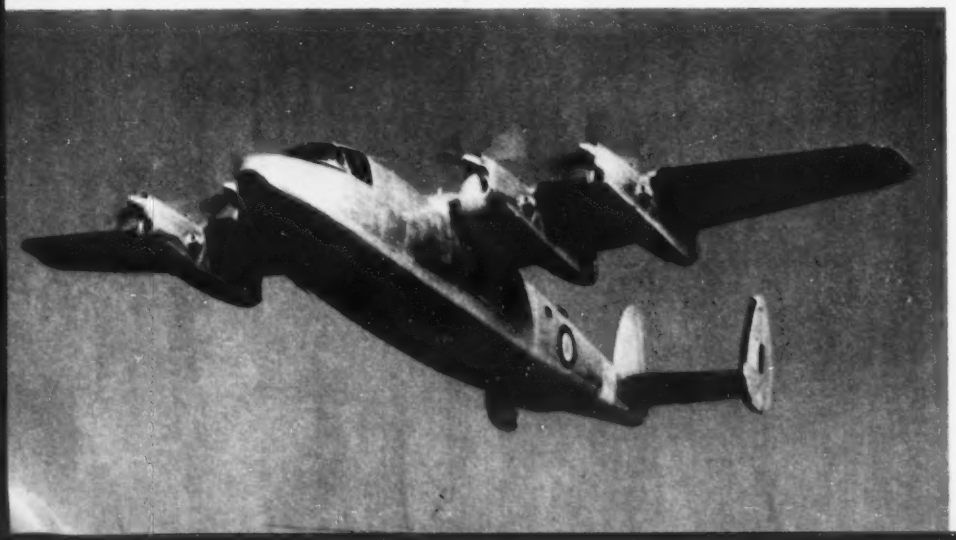

Power plant 4 D.H. Gipsy Queen
Span 65ft
Length 52ft 4in
Gross weight 17,535 lb
Max. speed 230 m.p.h.
(Data and illustrations for Marathon 1A)
Power plant Rolls-Royce Avon or Armstrong Siddeley Sapphire
Span 33ft 8in
Length 45ft 3in

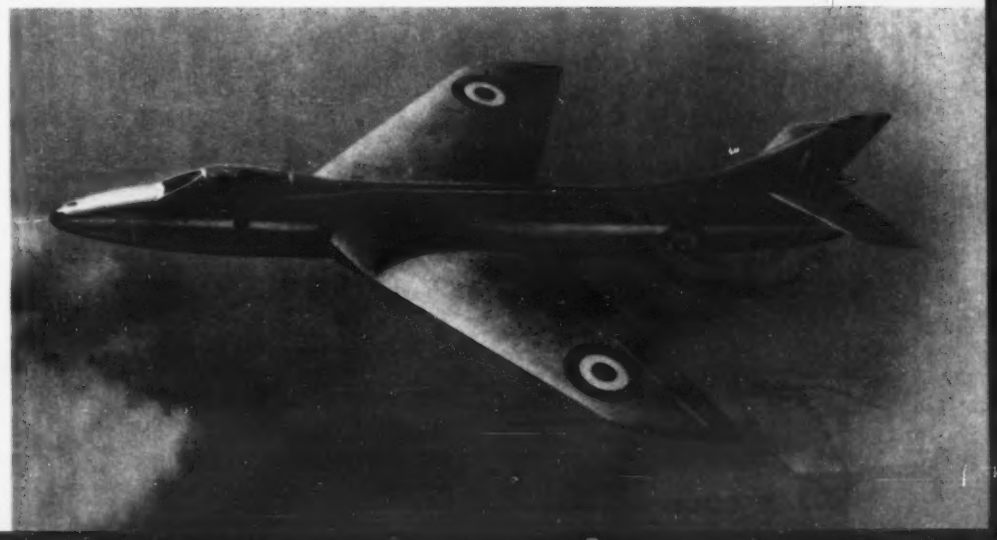
Handley Page Marathon

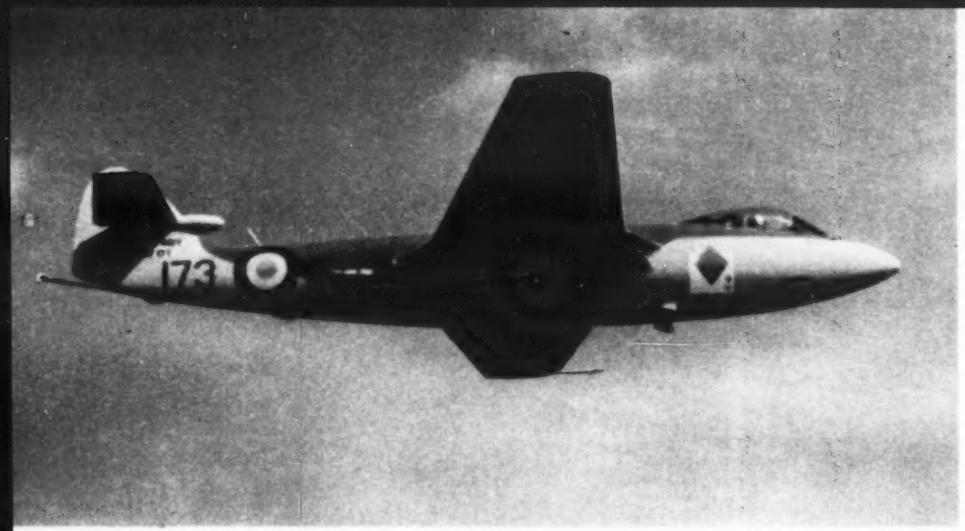
THIRTY-NINE Marathons, of military and civil type, are in service or on order. West African Airways (six) and Union of Burma Airways (three) are the civil operators concerned: the remaining batch of 30 will be used for training R.A.F. navigators. As an airliner, the Marathon carries 18-22 passengers on stage-lengths of up to 800 miles at 170 m.p.h. In training form, it has stations for two pupil navigators and a staff crew of pilot, navigator and signaller. Special equipment for this rôle includes Rebecca, Gee, radio compasses and pear-drop windows. Engines in the Mk 1A version are four Gipsy Queen 70 Mk 4s, giving a maximum cruising speed of 206 m.p.h. at 5,800ft. Extra fuel is carried, providing an ultimate range, cruising at 160 m.p.h., of 1,400 miles. Gross weight of the military Marathon is lower than that of the civil mark (17,535 lb, compared with 18,250 lb). All-round performance is good for an aircraft in this category: the Marathon 1A clears 50ft in 900 yd and climbs to 10,000ft in 4 minutes.

Hawker Hunter

ASSUREDLY one of the most beautiful machines to take the air, the Hunter is an interceptor fighter, powered either with a Rolls-Royce Avon or Armstrong Siddeley Sapphire turbojet. Although at the time of writing all public demonstrations of supersonic flight by the type have involved a dive, it is reasonable to suppose that the increases in power offered by the latest marks of Avon and Sapphire, with afterburning, will permit attainment of Mach 1 in level flight. As for armament, the four large gun ports under the fuselage nose lend support to statements published abroad which credit the Hunter with the devastating fire power of four 30 mm guns. On the prototypes and production aircraft the mainplanes are swept at approximately 30 deg, but there is no apparent reason why sharper sweep should not be incorporated should this be warranted. Extreme precision of control at speeds in the region of 700 m.p.h. and at exceptionally low level has frequently been demonstrated by the Hunter.







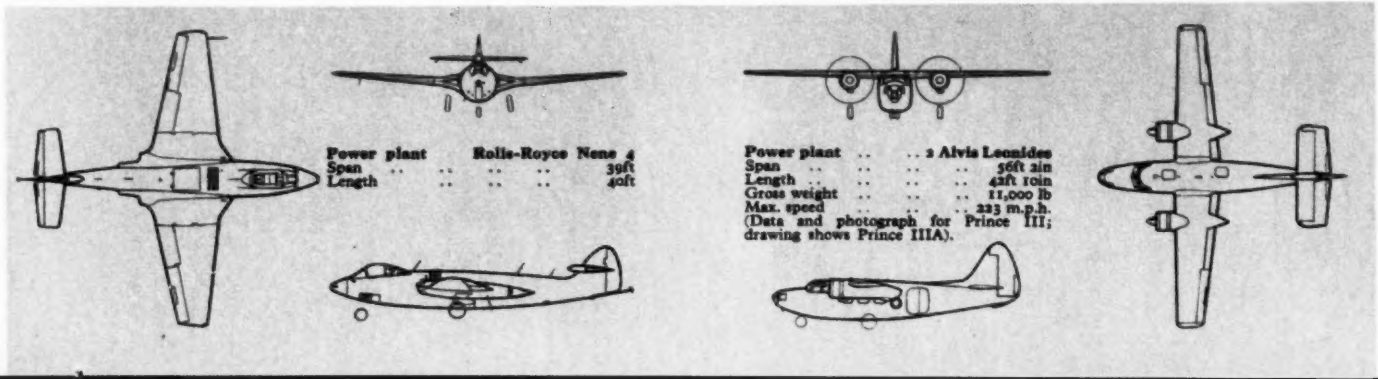
Hawker Sea Hawk

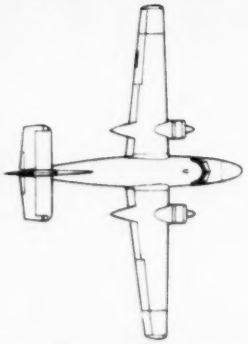
IN the few months during which the Sea Hawk F.1 has been in service with the Fleet Air Arm of the Royal Navy the type has won golden opinions. It is a trim, straight-wing, deck-landing fighter or fighter/bomber of extremely clean design, powered with a Rolls-Royce Nene turbojet fed by twin air intakes in the wing-roots. These discharge at low velocity into a plenum chamber and aft of the turbine the jet-pipe is bifurcated, the two tailpipes emerging from the fuselage at the trailing-edge wing-roots. The makers claim that this greatly reduces the frictional loss associated with long intake and exhaust systems, at the same time affording valuable space for equipment fore and aft of the power plant. The outer wing panels are attached to the stub wings by hinge fittings incorporating automatic locks and, of course, are power folded. The Sea Hawk's armament is four 20 mm guns and a Martin-Baker ejector seat is a standard fitment. Production is in the hands of Sir W. G. Armstrong Whitworth Aircraft, Ltd., the manufacturing resources of the parent company now being concentrated on the swept-wing Hunter.

Percival Prince

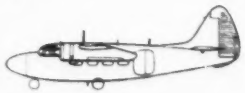
CIVIL operators, for whom the Prince was originally designed, have taken delivery of over 25 of these Leonides-powered, multi-purpose light transports. In addition, Sea Princes are extensively used by the Fleet Air Arm. Several versions have been developed since the prototype Prince first flew in 1948. The standard Series III (civil) accommodates eight passengers or an equivalent amount of freight. A lengthened, glazed nose, containing an observer's photographic position, identifies the Survey Prince IIIA, which has been adapted to carry a wide variety of camera installations; its total tank capacity is 227 gal, compared with 173 gal in the Series III, giving a still-air range of 1,000 miles. Yet another civil version is the Prince IIIB, as used by the M.C.A. to calibrate radio and radar systems. The Shell Petroleum Co. and Standard Motor Co. operate luxurious six-seater V.I.P. Princes. Naval versions are the C.1 (eight-seater liaison aircraft corresponding to the Series III), C.2, with increased payload, and T.1, a trainer for navigational and anti-submarine work.

BRITISH AIRCRAFT 1953

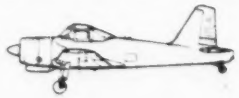

Power plant .. Rolls-Royce Nene 4
Span 39ft
Length 40ft
Power plant .. .. 2 Alvis Leonides
Span 56ft 2in
Length 42ft 10in
Gross weight .. .. .. 11,000 lb
Max. speed .. .. .. 223 m.p.h.
(Data and photograph for Prince III; drawing shows Prince IIIA).

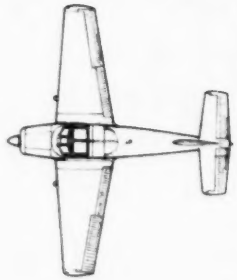


Power plant	2 Alvis Leonides
Span	64ft 6in
Length	46ft
Gross weight	13,000 lb
Max. speed	220 m.p.h.



Power plant	Alvis Leonides 25
Span	35ft 2in
Length	29ft
Gross weight	4,400 lb
Max. speed	200 m.p.h



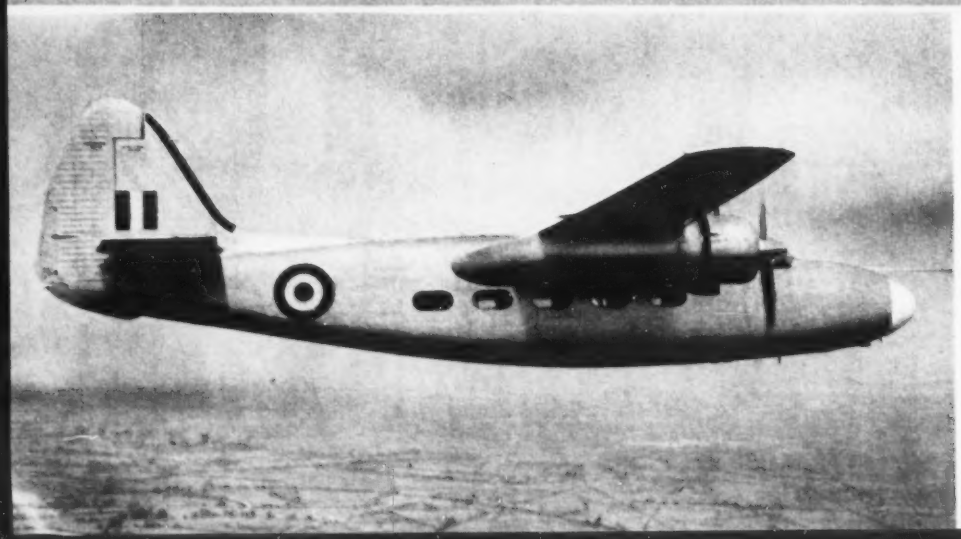


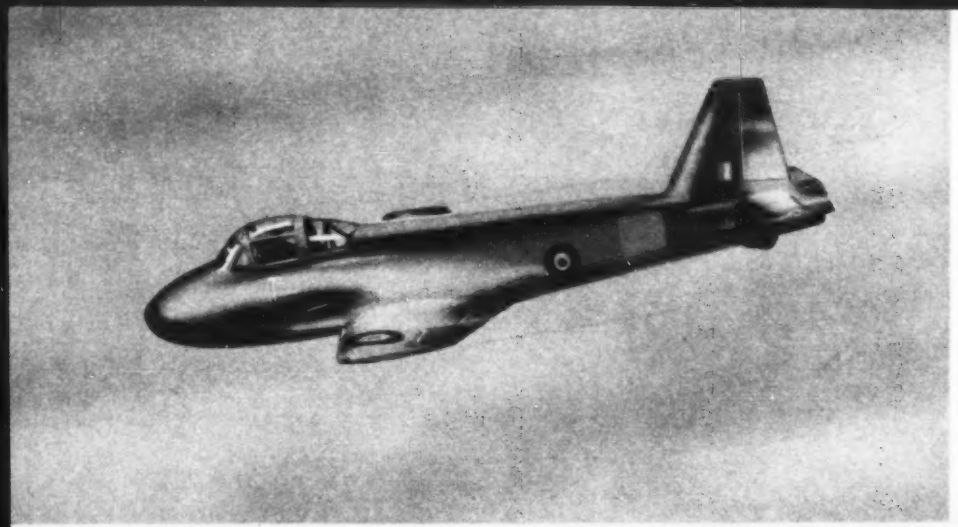
Percival Pembroke and Prince Series 5

AS the photograph suggests, the Pembroke is a direct development of the Prince. It is in production for the R.A.F. under the designation Pembroke C.1, and has also been ordered by the Southern Rhodesian Air Force and the Royal Belgian Air Force. Primary functions are the transport of Service personnel, supplies and equipment, and of sick or wounded (from both permanent and improvized air strips) and supply dropping. Removable dual controls can be installed for twin-engined pilot conversion or training; furthermore, a classroom version has been designed for the training of radio operators, navigators and bomb-aimers. The makers point out that a feature which enabled R.A.F. requirements to be met by the Pembroke with very little modification to the existing Prince configuration was the exceptionally roomy and unobstructed cabin. Eight passengers can be carried in rearward-facing seats, designed to withstand a 15 g deceleration. A new civil Prince, probably to be known as the Prince Series 5 and based on the Pembroke, is under consideration.

Percival Provost

USEFUL quantities of Percival Provost T.1 basic trainers have already been taken into service with the R.A.F., where the opinions of pilots and pupils bear out the handling reports of the Aeroplane and Armament Experimental Establishment at Boscombe Down. Of the prototype Provost "Boscombe" reported that it was "an aircraft in which a pupil would gain confidence in a very short while, handling being pleasant and easy. The aircraft has no vices. All basic training, including night flying, aerobatics, and navigation and instrument flying should be carried out simply and effectively." During handling trials it was established that a rate of roll of the order of 90 deg per second was attainable, and at 220 kt a full roll to the left was completed in 3.4 sec. For gunnery, bombing and rocket training the Provost can be adapted to carry any of the following loads: two 0.303in machine guns, with ammunition for 15 sec continuous firing, reflector sight and camera gun; eight 25 lb practice bombs, or two 250 lb bombs; or six 3in rockets with 25 lb warheads.





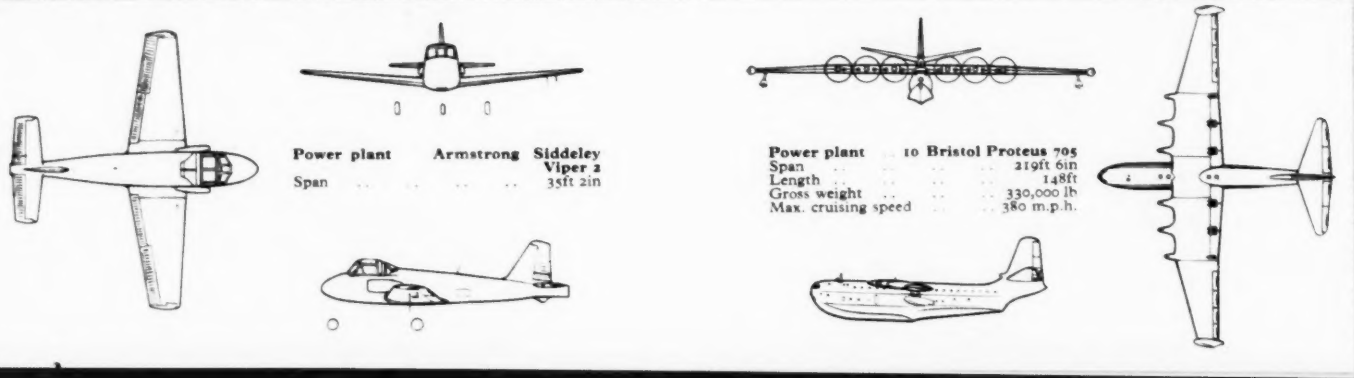
Percival Jet Provost

DURING March this year it was announced by the Under-Secretary of State for Air that the Air Ministry wished to consider the advisability of introducing a jet trainer into the R.A.F. at the basic stage, so that pupils could carry out the whole of their training on jet aircraft. Such a major change could not, he said, be decided on purely theoretical arguments, and the Government would make thorough practical trials within the training organization of the R.A.F. Later it was disclosed that an order had been placed with Percival Aircraft, Ltd., for a number of side-by-side two-seater jet trainers adapted from the Percival Provost T.1 and depicted in model form at Farnborough last year. The Jet Provost differs from its precursor essentially in being powered by an Armstrong Siddeley Viper 2 turbojet, for which air intakes are positioned on the fuselage sides in way of the cockpit enclosure. The main undercarriage is of the nosewheel type and has been made retractable. A Naval deck-landing version is also in mind.

Saunders-Roe Princess

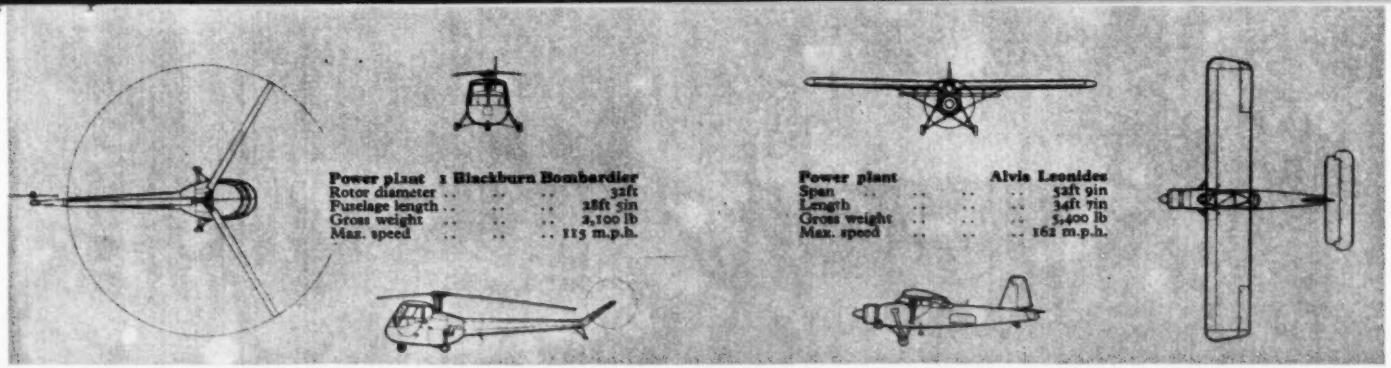
ALTHOUGH this 150-ton flying-boat has been flying since August 22nd last year, her two sister ships have been cocooned, and the future of the entire Princess project remains in the balance. Successive plans for operating the Princesses on B.O.A.C.'s routes and as R.A.F. troopers have been shelved, although the Minister of Supply recently agreed with a Parliamentary questioner that "it would be a tragedy if all the work which has gone into this project came to nothing." With capacity for 200 troops in the double-bubble fuselage, and a range of 3,500 miles, the Princess is claimed to be capable of carrying in one year as many troops as three ordinary troopships on strategic routes. The Princess is powered by ten Proteus turboprops—four coupled pairs and two single units outboard, giving her an estimated cruising speed of 380 m.p.h. Retractable wing-tip floats and powered controls are two important features. Four integral fuel tanks between the engine units carry a total of 14,500 gal of kerosine.

BRITISH AIRCRAFT 1953



Power plant	Armstrong Siddeley Viper 2
Span	35ft 2in

Power plant	10 Bristol Proteus 705
Span	219ft 6in
Length	148ft
Gross weight	330,000 lb
Max. cruising speed	380 m.p.h.

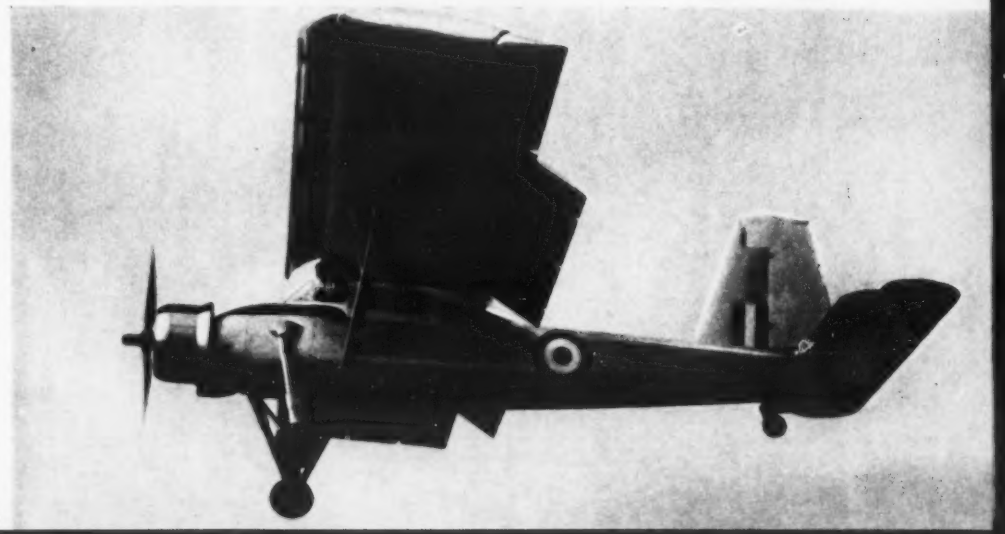

Power plant 1 Blackburn Bombardier
Rotor diameter 32ft
Fuselage length 28ft 5in
Gross weight .. .. .. 2,100 lb
Max. speed .. .. .. 115 m.p.h.
Power plant Alvis Leonides
Span 32ft 9in
Length 34ft 7in
Gross weight .. .. .. 5,400 lb
Max. speed .. .. .. 162 m.p.h.

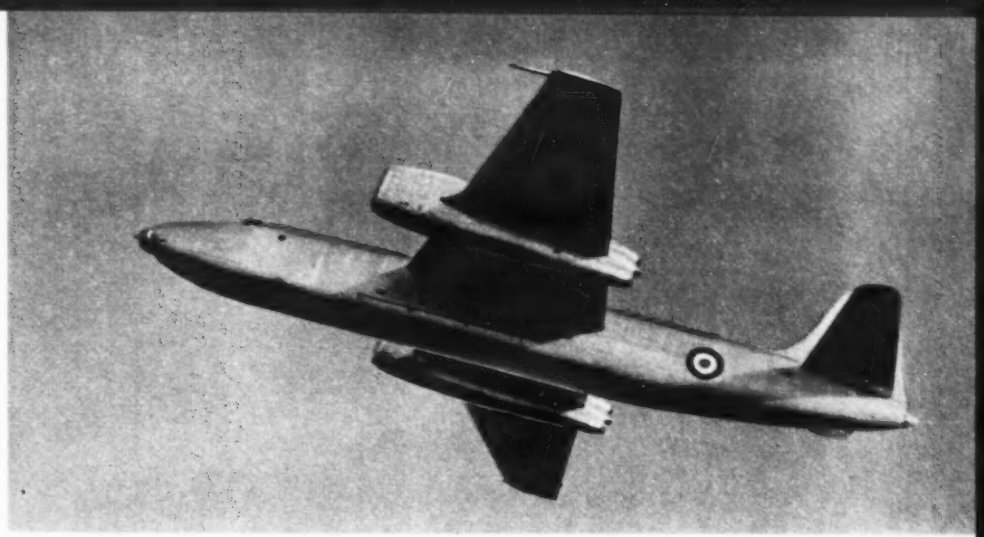
Saunders-Roe Skeeter

THE Saunders-Roe Skeeter is the only English example of the small helicopter. With an all-up weight of 2,100 lb and a rotor diameter of 32ft it carries a crew of two, and is suitable for a wide variety of duties from personal transport to cable-inspection and low-level reconnaissance. The Skeeter Mk 2 and Mk 3 are for civil use, the Mk 2 representing a major redesign of the earliest Mk 1. Mks 2 and 3 were powered by the Gipsy Major of 145 h.p., but in the latest civil version, the Mk 3B, a Blackburn Bombardier 702 of 180 h.p. gives more power and a consequent increase in performance. For the Army, the Mk 3B has been developed with a 23-gallon bullet-proof fuel tank giving an endurance at 75 kt of 4 hours; a camera, parachutes or armour plate protection can be fitted. The Mk 4 is a naval version with almost the same equipment and performance as the Mk 3B, and the same engine, but it derives greater endurance through the fitting of a 27-gallon, crash-proof fuel tank. Latest news from Saunders-Roe concerns a new pulse-jet unit for tip propulsion.

Scottish Aviation Prestwick Pioneer

AT Prestwick Airport last month the first of at least five of these extraordinary machines ordered for the Royal Air Force was formally handed over, and it is a tribute to their qualities, and to the amount of development behind them, that two are being put into service in Malaya without the usual period with a home squadron. The "helicopterish" take-off and landing attributes of the Pioneer are already known to Farnborough-goers. The type can be furnished to operate as a four-seat passenger aircraft, as an ambulance (carrying pilot, patient, nurse and, if necessary, a doctor), for air photography, dual-control training, or crop-dusting, or as a mailplane—to pick up and deliver mail in remote areas where landing is impossible. Low-speed performance is obtained by the fitment of full-span controlled slats, together with Fowler-type flaps. Both systems are operated by one control. Attached to the variable-incidence tailplane are very powerful balanced elevators. Tailplane incidence is controlled by an electric actuator operated by switches on the control column.





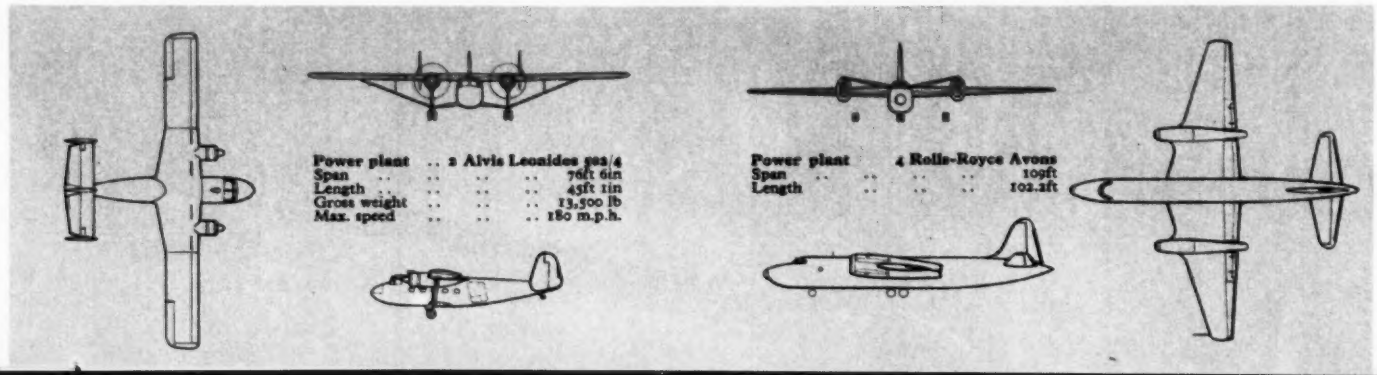
Scottish Aviation Prestwick Twin Pioneer

FURTHER development of the Twin Pioneer project since details were first published a year ago is reflected in illustrations showing the new three-fin arrangement. Of simple and sturdy construction, the Twin Pioneer is designed as a 14/16-seat general-purpose light transport, powered by two 550 h.p. Alvis Leonides. It features a high wing, fixed tailwheel undercarriage, and slats and flaps giving exceptional take-off and slow-flight characteristics. Estimated length required to clear 50ft from grass at a.u.w. (13,500 lb) is 357 yd; the stalling speed with full flap (engine off) of 47.5 m.p.h. is very low for a modern transport aircraft. Even so, the Twin Pioneer cruises at speeds of up to 174 m.p.h. The manufacturers state that it is intended mainly for use in territories where no other fixed-wing aircraft can provide air transportation: by embodying in the Twin Pioneer virtues neglected in the majority of modern 'airliners, they may well enable many operators to tap new markets of local-service traffic.

Short S.A.4

THIS massive straight-wing four-jet bomber was first flown in 1951 and since that time machines of the type have been engaged on high-altitude, high-speed research for the Ministry of Supply. Designed to accommodate Air Staff requirements in the matter of radar, radio and other installations, the S.A.4 embodies very advanced ideas in anti-icing and would appear to be admirably suited for the testing of new bombing equipment and weapons. Features of the design are the paired engine installations, wherein one Rolls-Royce Avon is superimposed upon another, and the full-span servo tabs on ailerons and elevators. Performance details have not been released, though it is known that the S.A.4 has given highly satisfactory results. In this connection it may be recalled that the type was designed to an Air Ministry specification for a bomber which, while possessing relatively high performance characteristics, would not be unduly unorthodox in layout. Thus the S.A.4 is obviously at some disadvantage, in the matter of speed, at least, compared with newer swept, delta, and crescent-winged types.

BRITISH AIRCRAFT 1953


Power plant .. 2 Alvis Leonides 503/4
Span 76ft 6in
Length 45ft 11in
Gross weight .. .. .. 13,500 lb
Max. speed .. .. .. 180 m.p.h.
Power plant 4 Rolls-Royce Avons
Span 109ft
Length 102.2ft

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SUPERMARINE WORKS

7

BRITISH AIRCRAFT 1953

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(7) *Vickers Viscount 701 airliner (four Rolls-Royce Darts) in B.E.A. service.*

(8) *Bristol Type 173 Mk 1 helicopter prototype (two Alvis Leonides).*

(9) *De Havilland Comet Series 1A airliner (four D.H. Ghosts) in service with Air France.*

9

10

11

(10) *Avro Vulcan bomber prototype (four Rolls-Royce Avons but now flying with A.S. Sapphires) ordered for the Royal Air Force with Bristol Olympus turbojets.*

(11) *Percival Pembroke communications aircraft (two Alvis Leonides) for the Royal Air Force.*

(12) *De Havilland Vampire T.11 Trainer (D.H. Goblin) in R.A.F. service.*

(13) *English Electric Canberra (two Bristol Olympus) high-altitude test-bed and world record holder.*

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Established and Proven

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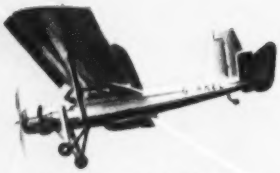
The de Havilland Beaver



The Prestwick Pioneer

The Percival Provost

The Percival Prince

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Low Weight Power Ratio — Compact Dimensions — Proven Reliability

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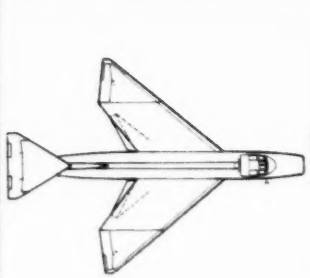
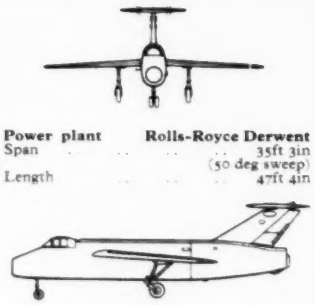
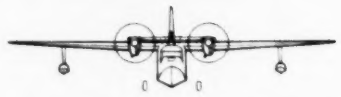
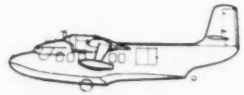


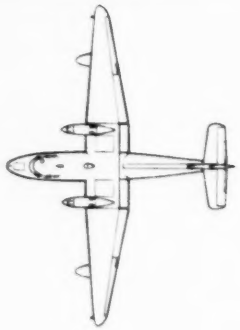


Power plant	Rolls-Royce Derwent
Span	35ft 3in (50 deg sweep)
Length	47ft 4in





Power plant	4 D.H. Gipsy Queen
Span	61ft 5in
Length	42ft 5in
Gross weight	9,100 lb
Max. speed	185 m.p.h.

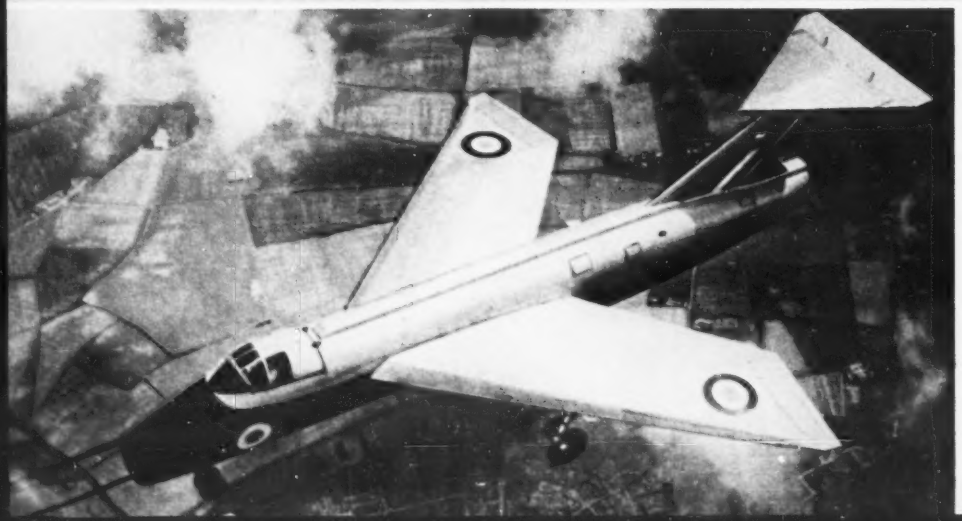


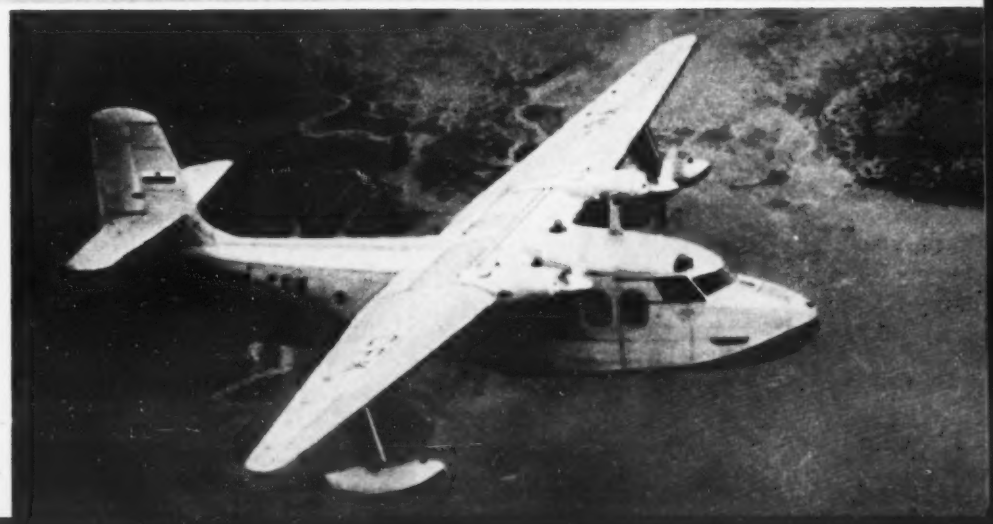
Short S.B.5

PARADOXICALLY perhaps, although this remarkable aircraft is intended for research which will lead ot the development of ultra-high-speed aircraft, it is in itself a low-speed type. It should be explained that, although the general behaviour of swept wings can now be predicted with confidence, difficult conditions may be met at low speeds, when the air flow has a tendency to break away at the tips and bring about some loss in lateral control. This effect is particularly pronounced when the sweepback angle exceeds about 35 deg. Thus, the S.B.5 has been built to be adaptable to four different configurations—50 deg sweep with high tail; 60 deg sweep with high tail; 60 deg sweep with low tail; and 69 deg sweep with high tail. Each of these arrangements can be tested within a range of c.g. positions by changing the attitude of the main undercarriage legs (which are not retractable), and changing the sweepback angle involves little more than a few minutes' work with a spanner.

Short Sealand

THE Short Sealand amphibian has now been in production for some five years and has gone into service in countries all over the world. A 5/8-seater twin engined amphibian with reversible-pitch propellers, it is suitable for operation in those areas where landing areas are scarce and demands for air transport varied. Needing only a pilot to operate it, it has a maximum disposable load of 1,868 lb and an all-up weight of 9,100 lb. Cabins and baggage space total 410 cu ft. Sealands are now in operation in Norway, Jugoslavia, Egypt, Pakistan and Borneo, and ten are being delivered to the Indian Navy. Various interior arrangements are available for the Sealand and conversion is easy and rapid from passenger to freight-carrying or for mixed loads. Patrol, rescue, survey and executive transport are also among the many duties for which the aircraft can be adapted. Although no longer produced, the four-engined Solent and Hythe flying-boats continue to uphold Short's reputation on the marine airways.





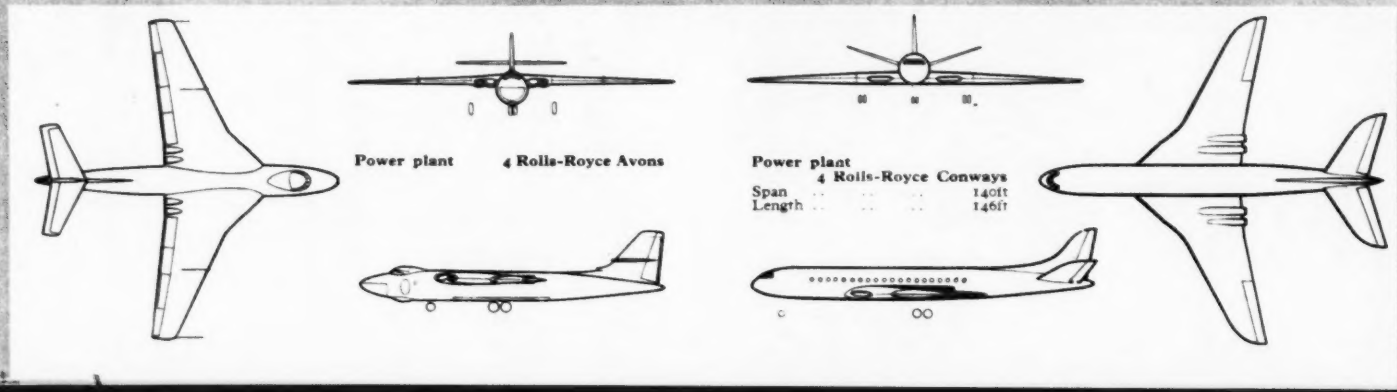
Vickers-Armstrongs Valiant

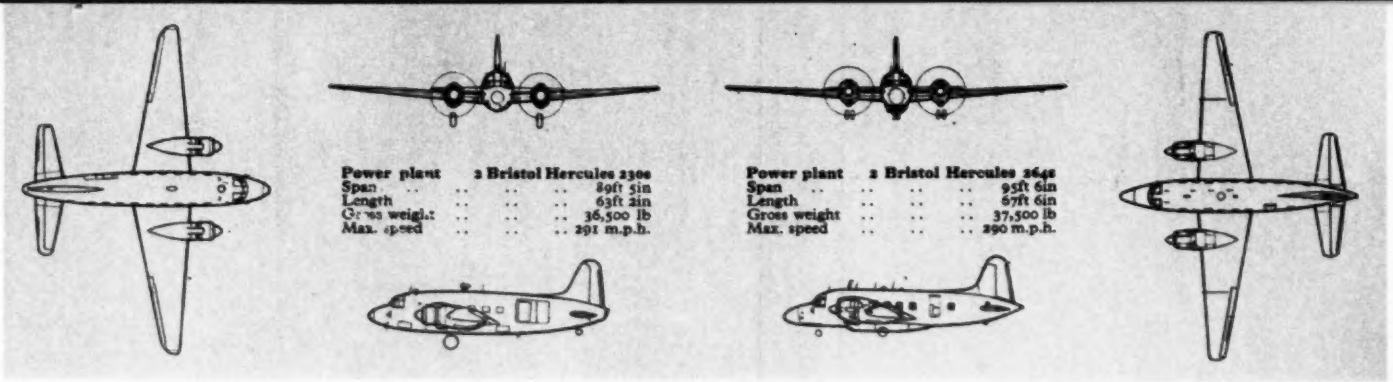
AERODYNAMICALLY one of the cleanest large aircraft yet to fly, the Valiant nevertheless has a wing of generous area and this is a major factor contributing to its reputedly exceptional performance at great altitudes. The lines of the fuselage are broken only by a highly streamlined cockpit enclosure and a small bulge beneath the forward portion. Mainplanes and tail surfaces are moderately swept and the former have boundary-layer fences. In their root sections are housed two pairs of Rolls-Royce Avon turbojets, aspirated through leading-edge intakes, each intake serving one pair of engines. The main wheels of the undercarriage are paired in tandem and retract sideways into recesses in the wing; the double-slotted flaps are of very large area and are in six sections. At the moment of writing the only version of the Valiant to which reference is officially allowed is the B.1 bomber, but it is clear that the aircraft has a development potential for a variety of applications. Performance in the New Zealand Air Race will be watched with the keenest interest.

Vickers-Armstrongs 1000 and V.C.7

IN January of this year Vickers-Armstrongs, Ltd., announced that they had been authorized to start work on a new jet-propelled military transport known as the Vickers 1000. Very little can be said of this most interesting aircraft beyond what can be gathered from the photograph, but it is known that the intended power plant is four Rolls-Royce Conway by-pass units, which reconcile very high thrust with unusual fuel economy. The general pattern of the Vickers 1000 follows that of the Valiant bomber, though the span has been extended and the wing-tip form revised. Concurrently with the Vickers 1000, work is in hand on a civil project of similar type, designated V.C.7 and capable of operating on very long trans-oceanic routes or over relatively short distances—in the latter case with up to 150 passengers. An American report avers that the international version will operate at a weight of 222,000 lb, whereas, the "domestic" model will have an all-up weight of 180,000 lb. Externally, the V.C.7 will be almost identical to the Vickers 1000.

BRITISH AIRCRAFT 1953




Power plant 2 Bristol Hercules 230e
Span 89ft 5in
Length 63ft 2in
Gross weight .. .. .. 36,500 lb
Max. speed .. .. .. 291 m.p.h.
Power plant 2 Bristol Hercules 264s
Span 95ft 6in
Length 67ft 6in
Gross weight .. .. .. 37,500 lb
Max. speed .. .. .. 290 m.p.h.

Vickers-Armstrongs Valetta

THERE are three R.A.F. marks of this military development of the Viking, for three distinct duties. The Valetta C.1 is the most widely used and is a multi-purpose transport for troops, freight, paratroop and supply dropping, and ambulance work. The C.2 is a special V.I.P. version with seats for 9-15 passengers and equipped with a pantry and special baggage stowage. (This model also has additional fuel tanks which increases the range to over 1,300 miles.) The third of the series—the T.3—is a special navigational "flying classroom" and can be distinguished by the six astrodomes strung out along the top of the fuselage. Although as a transport the Valetta does not have the advantage of rear loading or nose loading, it does have a large freight-loading door, measuring 8 ft 6 in x 5 ft 8 in, in the port side of the fuselage. The total volume of the main cabin is 1,565 cu ft, and the specially strengthened floor and the sides of the fuselage (which is elliptical in section) are well provided with freight tie-down points.

Vickers-Armstrongs Varsity

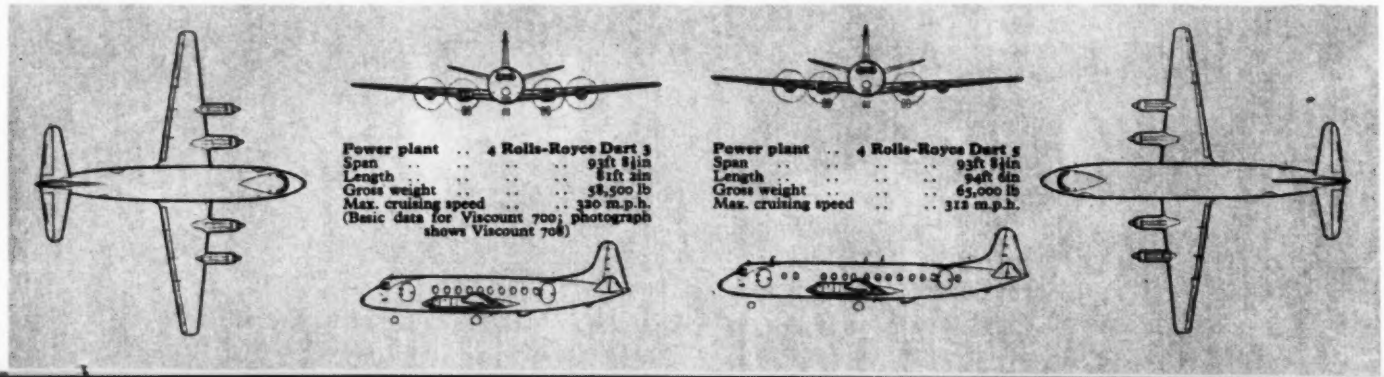
UNDER the designation Varsity T.1 the Royal Air Force is employing this type of aircraft as a "flying classroom," for the training of aircrews, the specified rôles being air navigation/bomb-aiming, pflot training and signals training. Between the flight deck and the wing spar, in an underslung cell which can also contain twenty-four 25 lb practice bombs, is a side-by-side bomb-aiming station for instructor and pupil, and aft of the spar is a combined station for two pupils operating H2S radar, with a separate seat for an instructor. Accommodation is available for four additional pupils if required. Although the Varsity is a descendant of the Viking and Valetta, it is a somewhat larger and more powerful machine and has a nosewheel undercarriage, in conformity with modern practice. Safety features include a fixed tailwheel for protection in the event of unduly tail-down landings, parachute and crash exits fore and aft, and "pull-in" cabin windows. Access panels are generously distributed throughout the airframe.

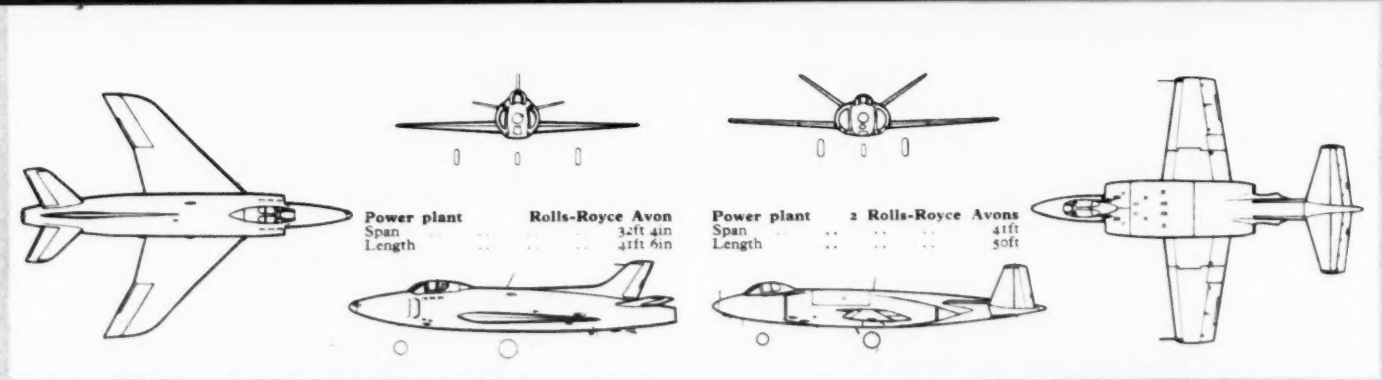
Vickers-Armstrongs Viscount 700

THE designation Viscount 700 applies to the basic design in production for eight airline companies, and each operator's version has a separate number. Thus, the Viscount 701 is the type chosen by B.E.A., first to take delivery. In their first 2,000 hr of operations with this airline, Viscounts achieved remarkably fine results by any standards, despite their novelty. Average revenue per flying hour was £224, of which £34 was genuine profit; the average sector of 474 miles was flown in 2 hr 45 min; and a total of 16,400 passengers "flew Viscount" (a growing habit among European air travellers) during this period. The main factors contributing to the enjoyment of Viscount flight are now becoming widely appreciated: lack of vibration, low noise-level, comfortable seating (the average "tourist" layout is for 48) and large windows. From the operator's viewpoint, the Viscount offers an unrivalled combination of performance and economy over the 400-1,200-mile band of stage-lengths. The four Rolls-Royce Darts give a cruising speed of over 300 m.p.h. at 22,500ft.

Vickers-Armstrongs Viscount 800

THE promise of further power from the Rolls-Royce Dart turboprops chosen for the Viscount led Vickers-Armstrongs and B.E.A., who have co-operated closely throughout the development of this fine aircraft, to explore the possibilities of an increase in payload. As a result, the Corporation placed an order last February for 12 Viscount 800s—longer by 13ft than the standard version, and capable of accommodating 66-82 passengers, compared with 48-62. The engines are to be Dart 5s, giving 1,690 e.h.p., but in most other respects the new Viscount will resemble its predecessor. Indeed, an important selling-point for the "800" is the standardization of parts and practices between the two versions. The makers describe it as a complement to the "700", rather than a replacement, enabling operators to apply each to the most suitable sectors of the route-network. The Viscount 800 is destined for high-density work on the shorter hauls, where its exceptionally low costs per seat-mile should bring highly profitable results.


Power plant .. 4 Rolls-Royce Dart 3
Span 93ft 8½in
Length 81ft 2in
Gross weight .. .. .. 58,500 lb
Max. cruising speed .. .. 320 m.p.h.
(Basic data for Viscount 700; photograph shows Viscount 708)
Power plant .. 4 Rolls-Royce Dart 5
Span 93ft 8½in
Length 94ft 6in
Gross weight .. .. .. 63,000 lb
Max. cruising speed .. .. 312 m.p.h.

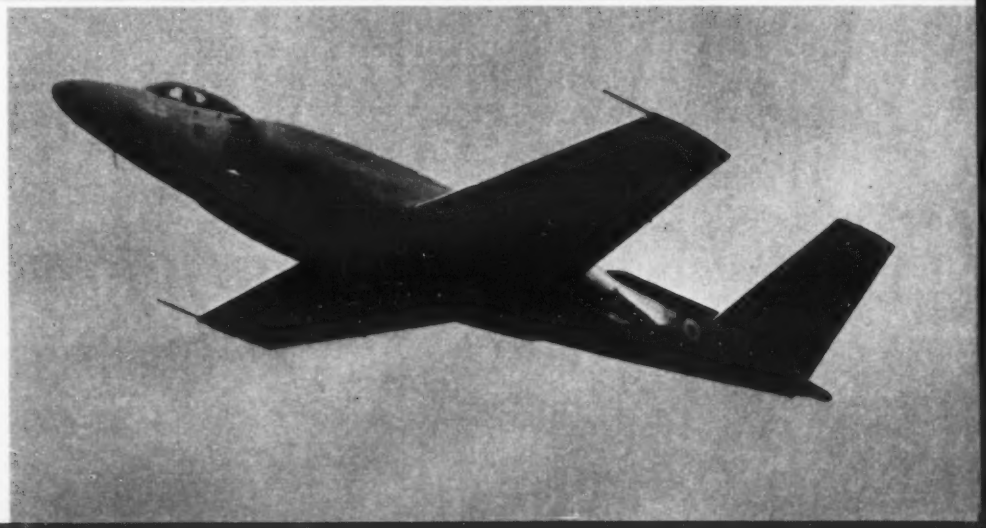


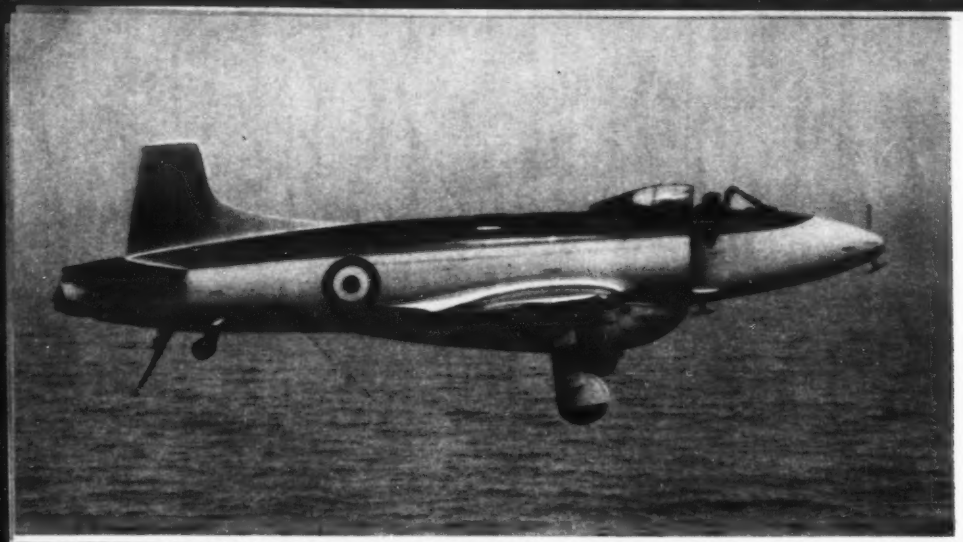
Vickers-Supermarine Swift

HAVING regard to its outstanding performance, fire power and all-round operational efficiency, it is hardly surprising that all data concerning the Swift intercepter fighter are withheld, though on numerous occasions it has been audibly proved that a Mach number in excess of 1 has been achieved in a dive. Visual inspection will show the Swift to be descended—though somewhat distantly—from the Attacker, its ancestry being traceable through the tail-down Type 510 (which, incidentally, has been successfully operated from an aircraft carrier) and the nosewheel Type 535. One of the essential differences between the Swift and the 535 is the installation of a Rolls-Royce Avon turbojet in place of the Nene, and for this an afterburner is provided in the tail end of the capacious fuselage. The first version to receive a Ministry of Supply mark number was, naturally enough, the Swift F.1, though this is not quite so superfluous a statement as might be supposed in view of the fact that the second variant announced is the F.4. Of this all that can be said is that modifications include "more powerful armament."

Vickers-Supermarine Type 508

THE straight-wing twin-jet 508 deck-landing fighter will be remembered from two Farnborough Displays past. Since last year a great deal of experience has been gained with two prototypes, and this April it was disclosed that an order had been placed for a substantial quantity of "twin-jet fighters developed from the Supermarine 508". It is generally understood that the development concerned will have swept wings and this feature, together with the tremendous thrust available from the two Rolls-Royce Avons and the extremely clean aerodynamic design, should result in a performance of an exceptional order. In evidence on the prototype 508s are four large gun ports, which have given rise to conjecture that the armament is four 30mm guns. One 508 has successfully undergone deck-landing trials aboard H.M.S. *Eagle*, and in this connection it may be remarked that an official reference has been made to a landing speed "kept within the requirements for carrier operations by the use of special high-lift devices on the very small-area thin wing". Visitors to former "Farnboroughs" will know that one such device is a type of leading-edge flap.





Vickers-Supermarine Attacker

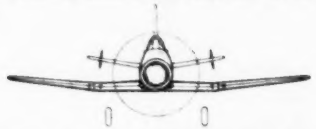
THE Attacker was the first jet fighter to go into large-scale service with the Fleet Air Arm. No. 800 Squadron was equipped in the summer of 1951 and embarked on the carrier H.M.S. *Eagle* that autumn. Additional squadrons have since been formed and are equipped with the later F.B.2 version, which differs from the F.1 in being a fully-equipped fighter/bomber, capable of carrying two 1,000 lb bombs or eight 60 lb rockets, and distinguished by a metal-framed canopy. The Attacker was originally developed from the E.10/44, which used the wing of the piston-engined Spiteful. Naval versions have power-folding wing-tips, carry a 270-gal ventral tank, and have the arrester hook and necessary range of equipment for Naval operations. A land-based type has been supplied in quantity to the Royal Pakistan Air Force. This is a fighter/bomber type, with metal-framed canopy. All marks are powered by a Rolls-Royce Nene and are fitted with a Martin-Baker ejection seat.

Westland Wyvern

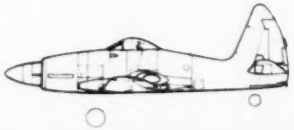
ALTHOUGH Wyvern deck-landing strike aircraft are now operating with the Fleet Air Arm, few technical data have yet been disclosed. It may be noted that the version in service is designated Wyvern S.4, the prefix "S" (signifying "strike") having supplanted the former symbols "T.F.", denoting torpedo/fighter. The S.4 may be distinguished from its forerunner, the T.F.2 (the T.3 was a prototype two-seater trainer) by a redesigned engine cowling, "spear-tipped" Rotol contra-rotating eight-blade airscrew, a stiffened cockpit canopy, small "fences" on the trailing edge of the wing, modified aileron tabs, horn-balanced rudder and dihedral tailplane—now fitted with two small additional fins. The Wyvern is a massive aircraft but nevertheless has a very high performance for a machine of its class, and even with a typical military load—a torpedo beneath the fuselage, sixteen rocket projectiles under the wings and four 20mm guns—can be put through all the usual aerobatic manœuvres. The thin wings have a double fold for carrier stowage.

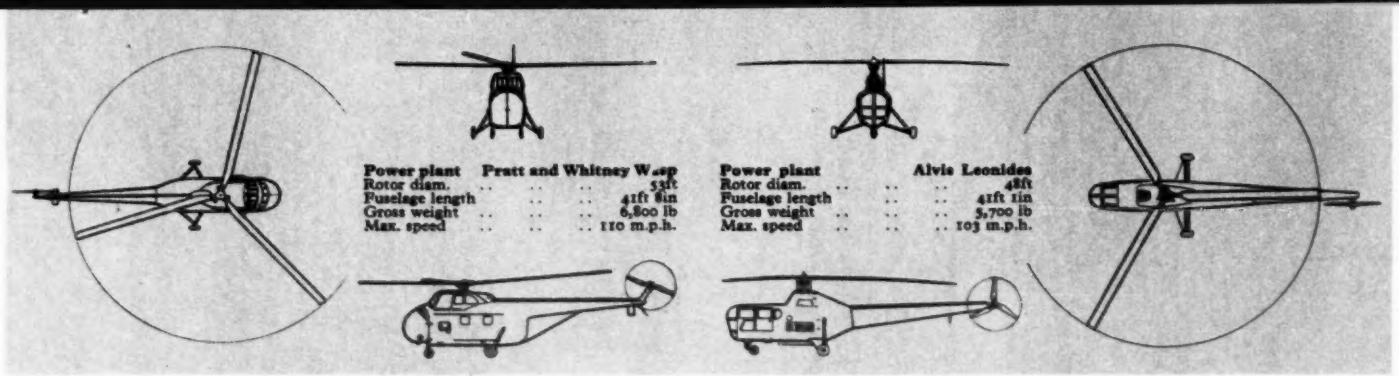
BRITISH AIRCRAFT 1953

Power plant	**Rolls-Royce Nene 4**
Span	36ft 11in
Length	37ft 6in
Gross weight	11,750 lb
Max. speed	583 m.p.h.



Power plant	**Armstrong Siddeley Python**
Span	44ft
Length	41ft 10in



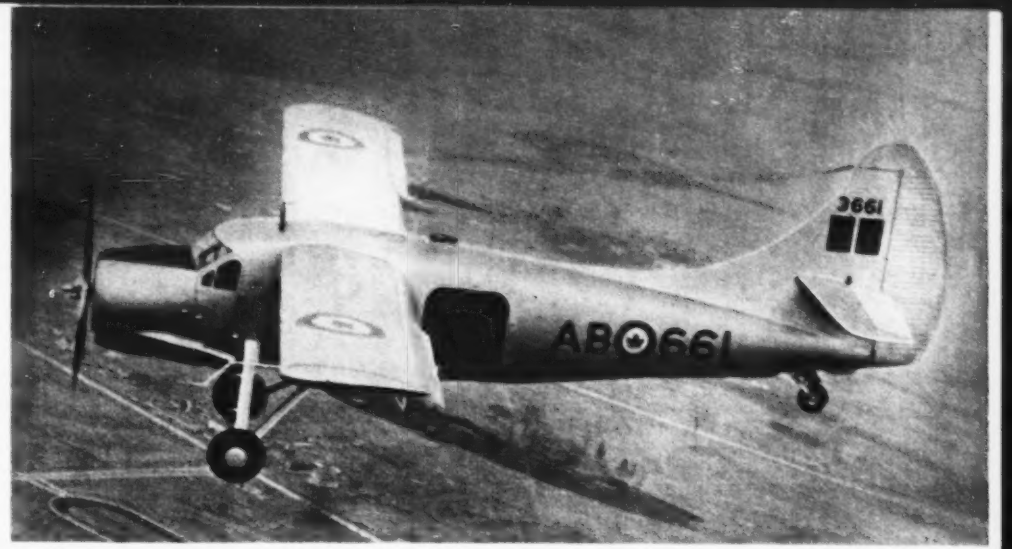

Power plant Pratt and Whitney Wasp
Rotor diam. 53ft
Fuselage length 41ft 8in
Gross weight .. .. .. 6,800 lb
Max. speed .. .. .. 110 m.p.h.
Power plant Alvis Leonides
Rotor diam. 48ft
Fuselage length 41ft 1in
Gross weight .. .. .. 5,700 lb
Max. speed .. .. .. 103 m.p.h.

Westland S-55

PRESENT examples of the S-55 built under licence by Westland Aircraft, Ltd., are powered by the 600 h.p. P. and W. Wasp. Later models however, will have the 800 h.p. Alvis Leonides Major, and the first of the new versions will be on static display at Farnborough. The S-55 is considerably larger than the S-51, being capable of carrying ten troops, or six passengers, luggage and freight. The engine is mounted at an angle in the nose and can be completely uncovered by the opening of "petal" cowlings. The all-metal rotor will fold for stowage and both cyclic and collective pitch controls are hydraulic servo operated. The pilot sits on the right so that he can operate wireless and other controls without removing his right hand from the control column. Winch-equipped S-55s have gone into service with a Naval squadron and have been doing valuable work in Malaya. Sabena, the Belgian airline, are now inaugurating the world's first international helicopter services with a fleet of three S-55s. With a range of 400 miles, the S-55 has proved itself admirable for rescue work.

Westland S-51

MALAYA is one of the many areas in which the S-51 has proved its reliability. The type is now produced solely in this country (under licence from Sikorsky) by Westland Aircraft. The military version, known as the Dragonfly, has been delivered to the R.A.F. and the Navy in various versions for liaison, transport and reconnaissance, many fitted with an hydraulic hoist for rescue duties. Although the early machines were powered by the Pratt and Whitney Wasp Junior, S-51s now have the Alvis Leonides of 550 h.p. The military versions are doing very useful work for the Forces and have taken part in such well-known operations as the *Flying Enterprise* rescue attempts. In original American-built form, the type has been intensively operated by British European Airways for some years—on both regular and special flights carrying passengers, mail and freight. A brand-new Westland-built example is now being used for reporting work with the *Evening Standard*. Sikorsky helicopters, incidentally, are estimated to have saved over 10,000 lives in Korea.



Avro Canada CF-100

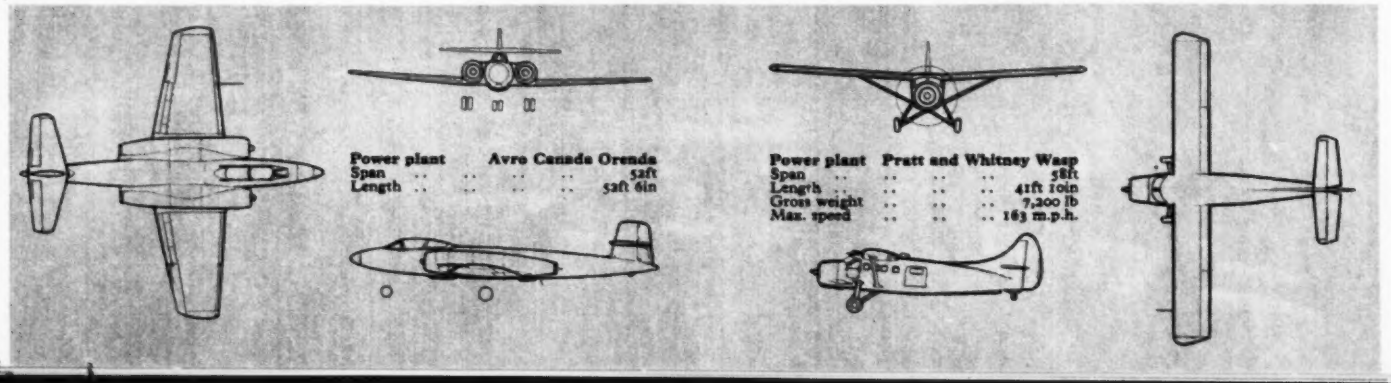
THE best news of the past year concerning this formidable Canadian-designed-and-built long-range all-weather fighter is that a machine of the Mk 4 type has achieved supersonic speed in a dive. The Mk 4 is superior in every way—thrust, speed, armament, manœuvrability and handling—to the former marks, and is powered with late-series Avro Canada Orenda turbojets. The purpose of the sonic flight tests was threefold: (1) to establish that the CF-100 was completely controllable at transonic and sonic speeds; (2) to remove former speed restrictions and eventually to qualify for a "no-limitation" rating on speed at high altitudes; and (3) to show R.C.A.F. pilots that, if they had to dive to attack or escape, the aircraft would be sufficiently powerful, and structurally sound enough, to penetrate the sonic zone. Few details concerning the Mk 4 have been released, though it is known that its primary armament consists of batteries of rocket projectiles. It is considered by the makers to be the most heavily armed intercepter fighter in the world today.

de Havilland Canada Otter

THIS is the "big brother" of the Beaver and carries nearly double the payload with comparable performance. It is remarkably roomy for a single-engined aircraft, and various layouts, providing seating for from 8-14 passengers, are possible. Thus, the ambulance version will take six standard Army stretchers, plus four passengers seated, in addition to the crew of two. In all cases the seating is arranged forward of the 39 cu ft stowage compartment at the rear of the cabin. Freight operators will appreciate the cabin measurements—5ft high and 5ft wide—and there is a 46in-wide loading door on the port side. Completely of metal construction, the Otter will operate on either wheels, floats or skis. It is powered with a geared Pratt and Whitney Wasp of 600 h.p. Along the trailing edges of the parallel-chord wing (max. lift coefficient 3) are full-span, double-slotted flaps. These are in two segments on each wing and when fully lowered cause the Otter to fly in a nose-down attitude, which gives the pilot an excellent forward view.

BRITISH AIRCRAFT 1953

(The Commonwealth)



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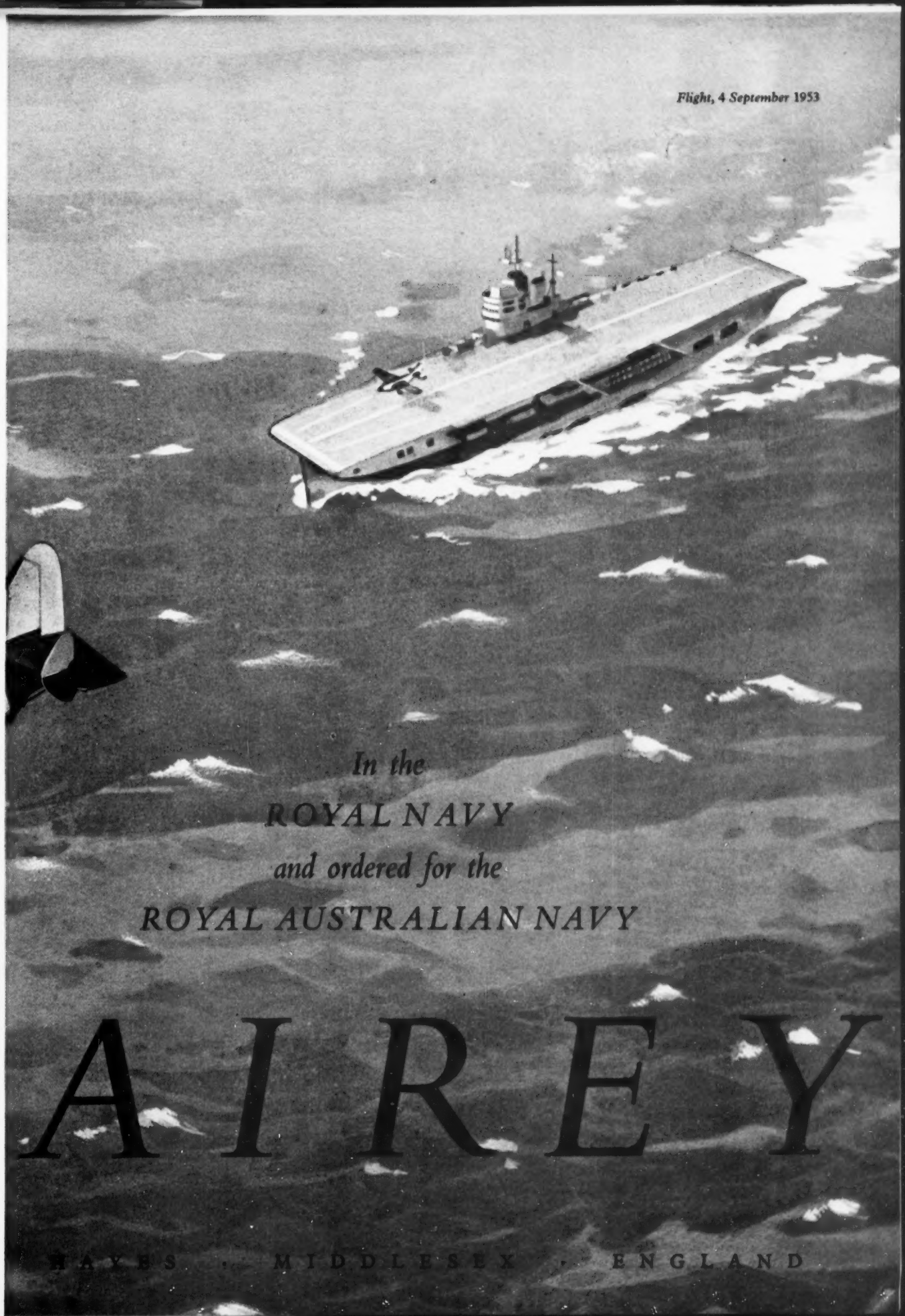

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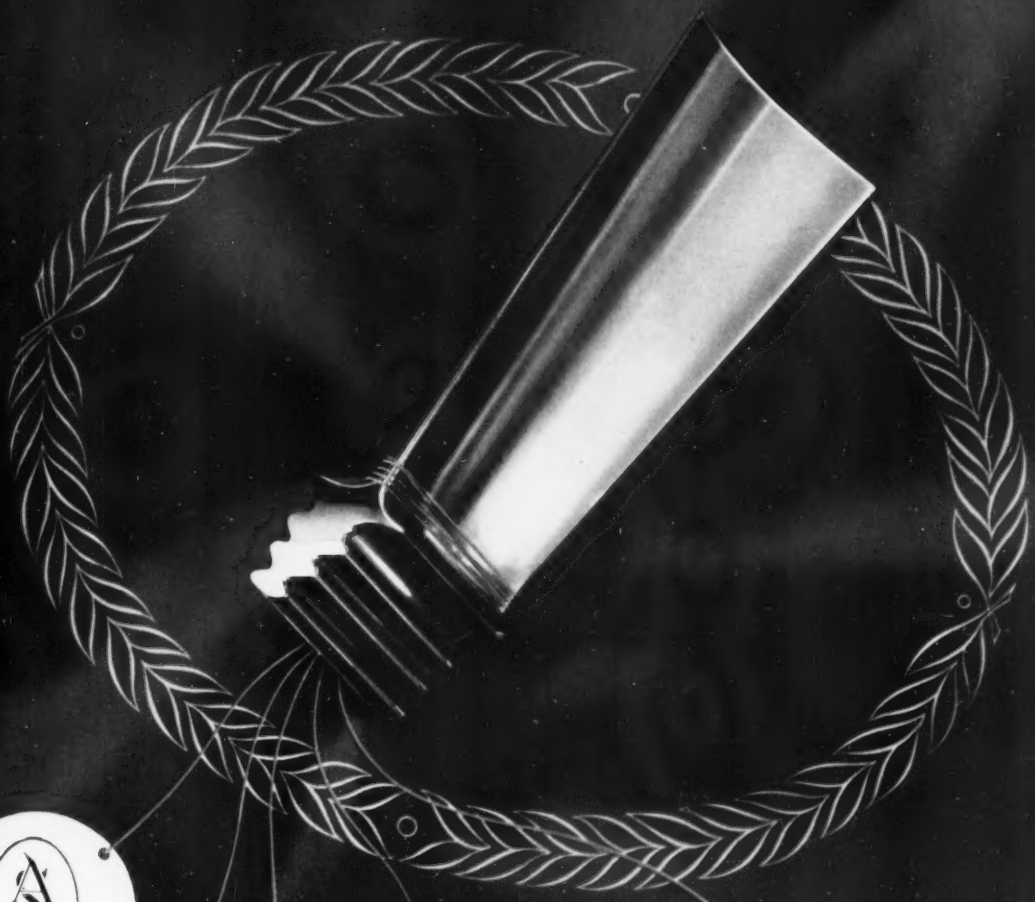

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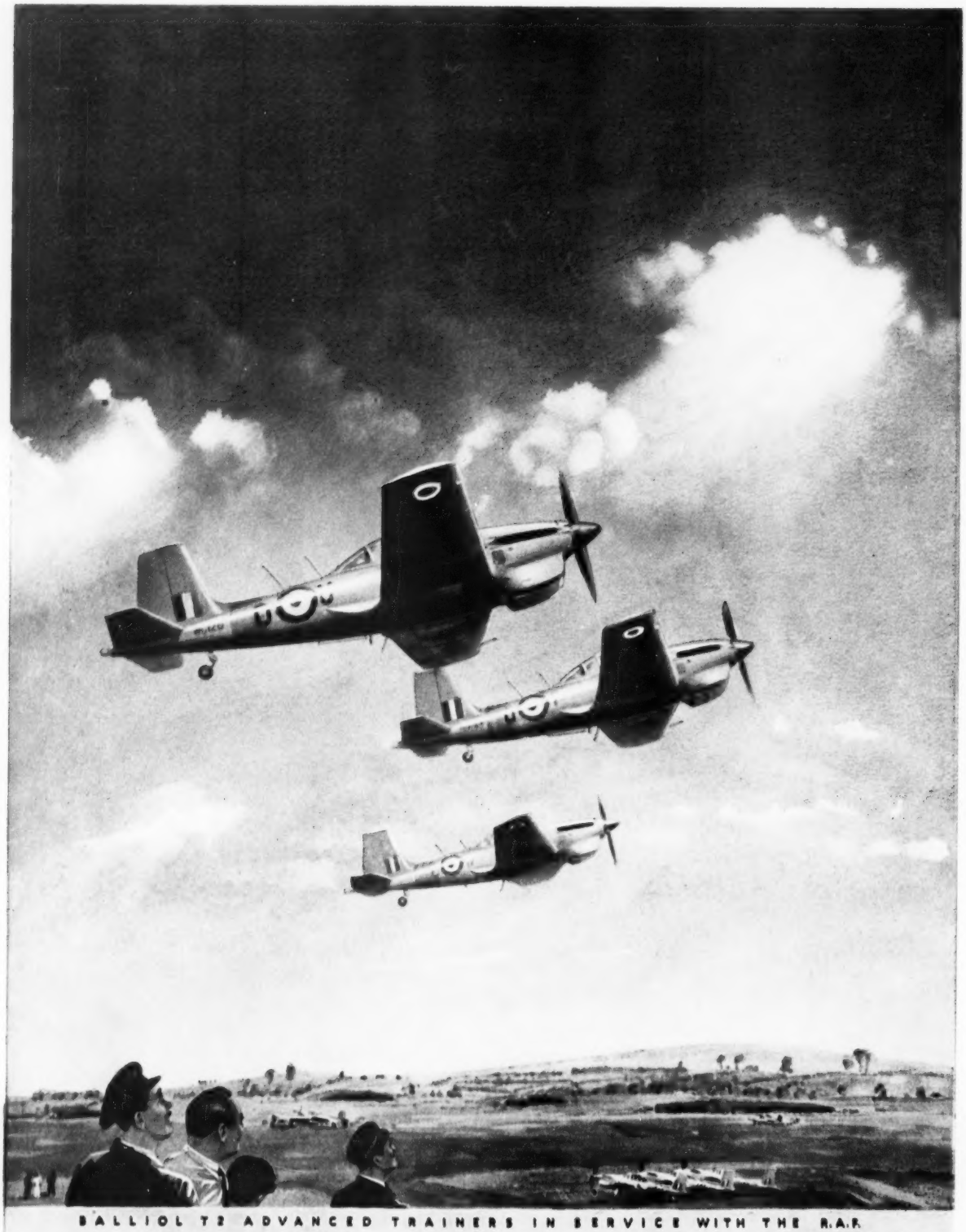

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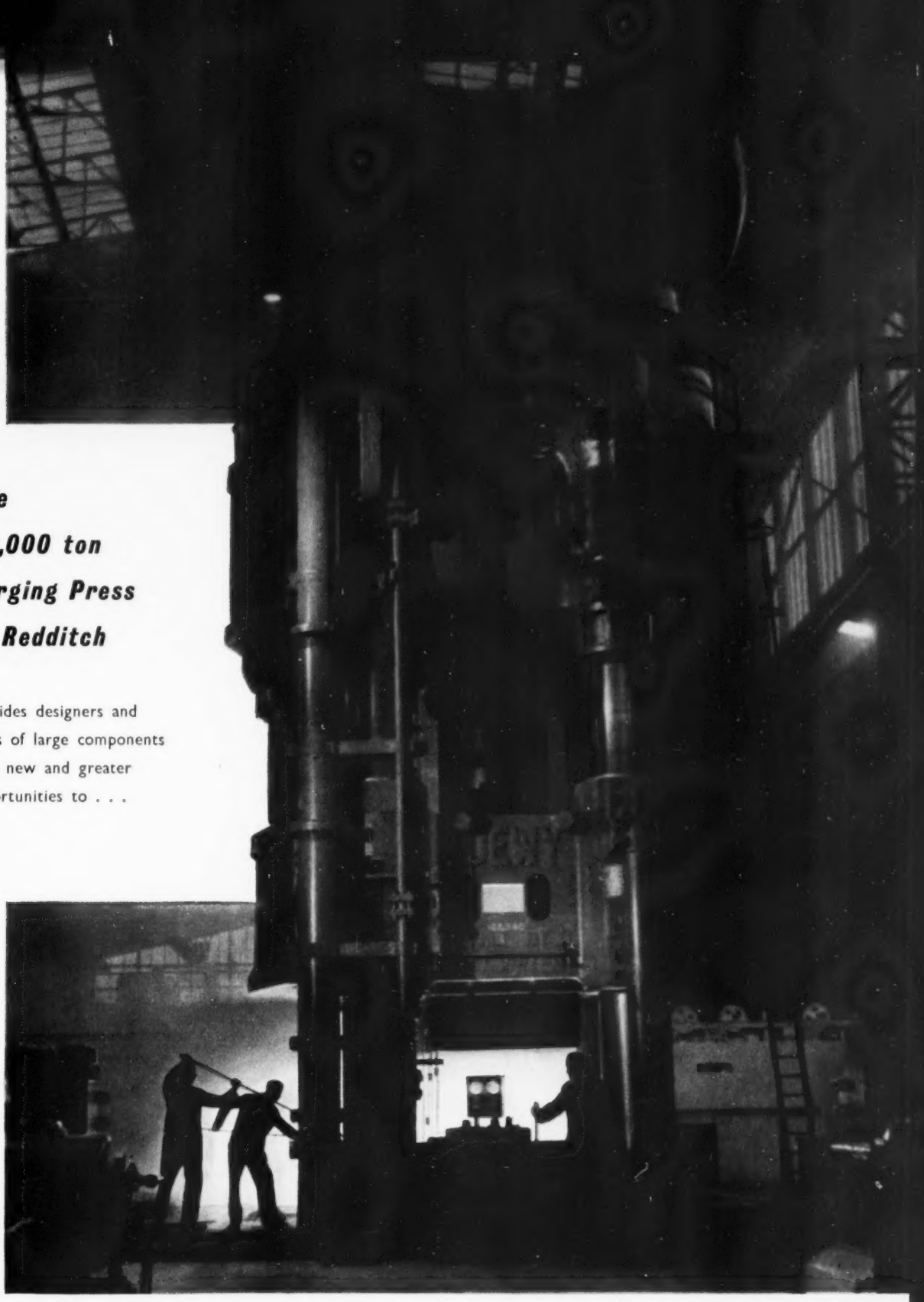

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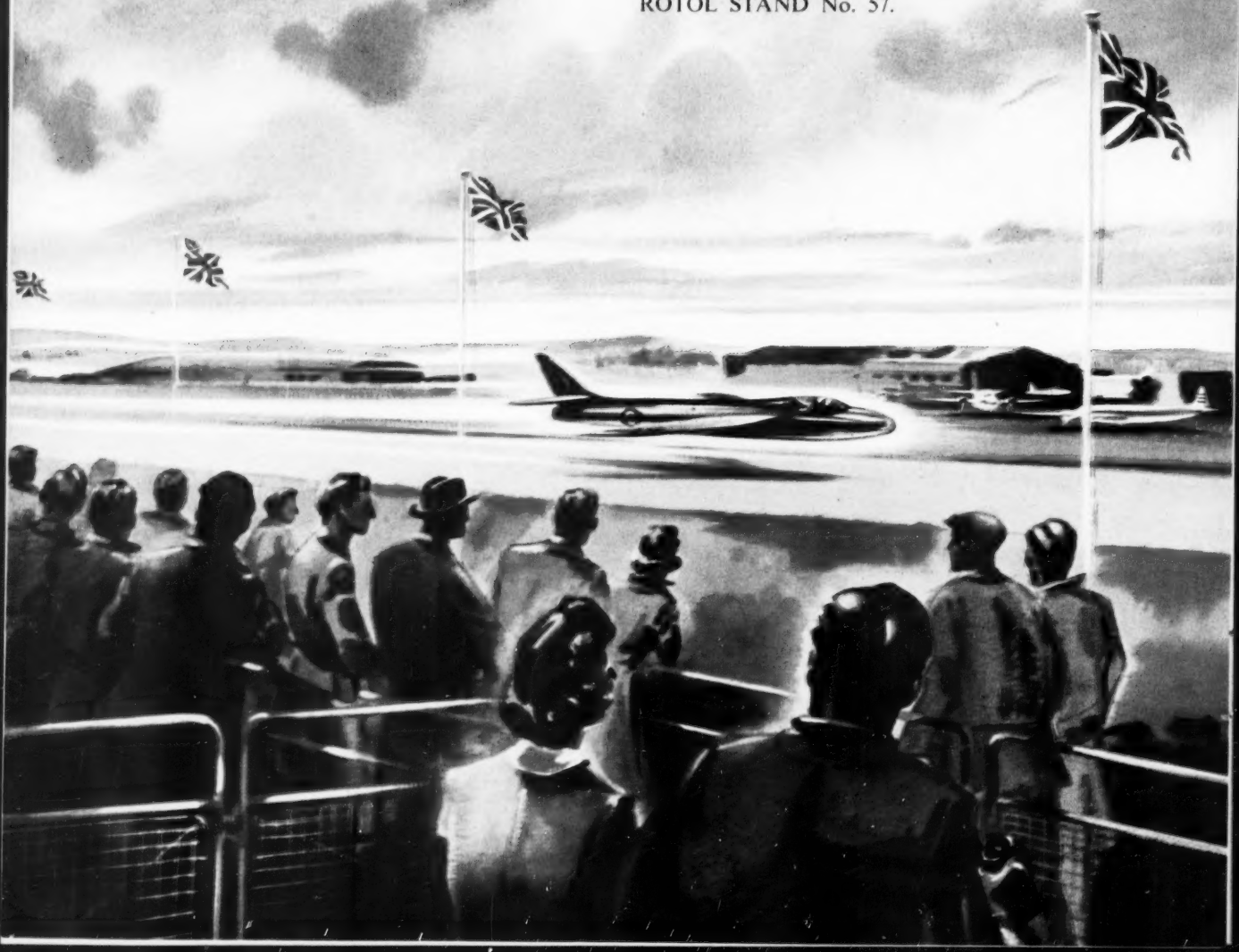
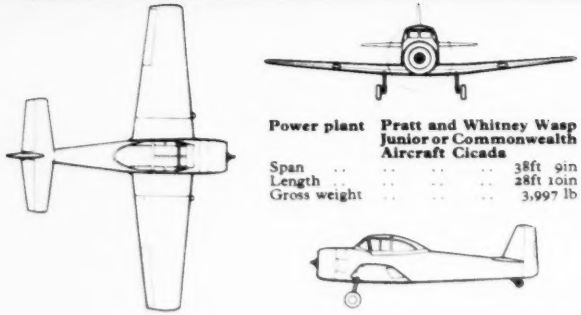
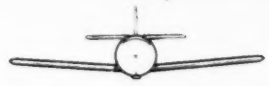




Power plant Pratt and Whitney Wasp Junior or Commonwealth Aircraft Cicada

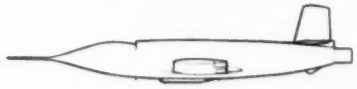
Span	38ft 9in
Length	28ft 10in
Gross weight	3,997 lb

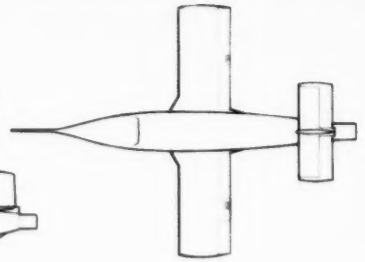


Power plant Armstrong Siddeley Viper

Span	19ft
Length	23ft (approx.)

(Data, photograph and drawing for Jindivik)



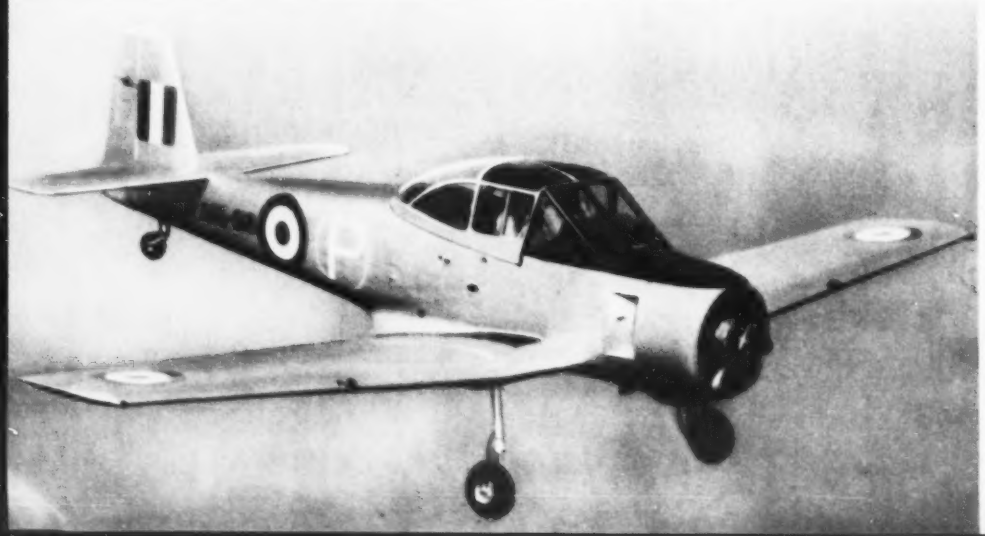


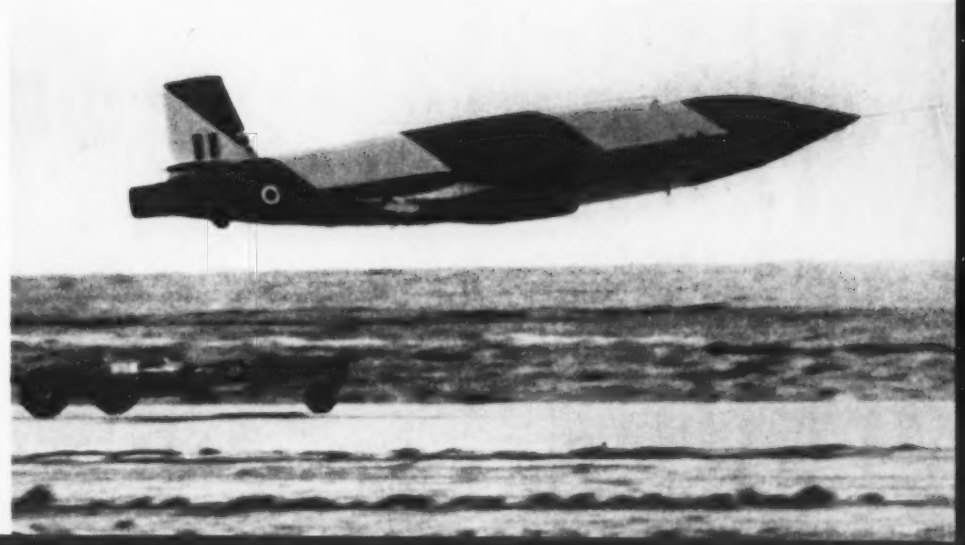
Commonwealth Aircraft CA-22

INITIALLY powered with a Pratt and Whitney Wasp Junior engine, this Australian-designed-and-built three-seat basic trainer, the first prototype of which flew in 1950, is intended eventually to have a 7-cylinder radial Cicada developed, like the airframe, by the Commonwealth Aircraft Corporation. Under the sturdy, jettisonable canopy, the instructor and a pupil are seated side by side, with dual controls, and a third seat, behind them, is available for a second pupil. Alongside this seat is the radio compartment. Two-stage amber screens for blind-flying training are, of course, fitted, in conformity with modern requirements. The undercarriage is of the fixed tail-down type. Construction is all-metal. It may be noted here that the Commonwealth Aircraft Corporation is also producing a version of the North American F-86 Sabre powered with a Rolls-Royce Avon, likewise built in the Corporation's factory. The prototype of this fighter, which is characterized by a larger, redesigned intake system and a heavier armament than the standard F-86E, flew during August this year.

Department of Defence Pika and Jindivik

RESPECTIVELY, these two small jet-propelled machines are a piloted and pilotless version of a design (to a Ministry of Supply specification dating from 1948) intended primarily for use as a high-speed target aircraft in connection with guided missile development. The Pika was built to reduce the development period and made its initial flight in October, 1950. Only two examples were built. The first Jindivik took the air in August last year and progress achieved to date is regarded as highly satisfactory, in view of the novel nature of the project and the fact that unproven airframes, engines (Armstrong Siddeley Adder) and equipment are being tested simultaneously. Twelve Jindivik Mk 1s have been made by Government aircraft factories, and prototypes of a Mk 2 version are now in existence. This latter variant has a Viper unit of about 1,600 lb thrust. As shown in the photograph, the Jindivik takes off from a tricycle trolley and lands on a single retractable skid. Control in flight is provided by radio from either a ground or an airborne station. A great deal of British equipment is used.

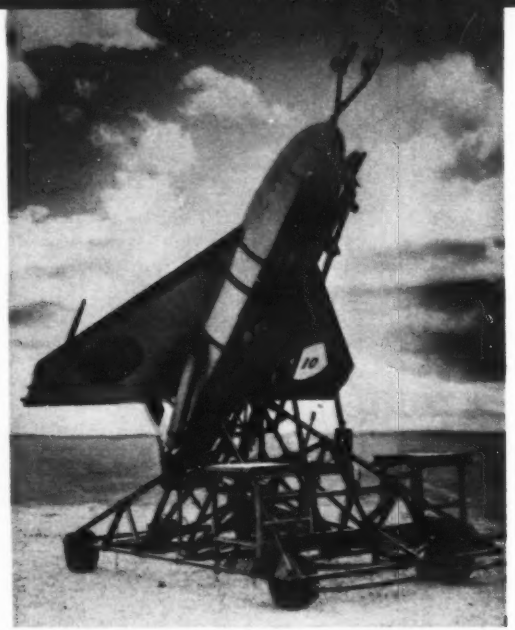




BRITISH AIRCRAFT 1953

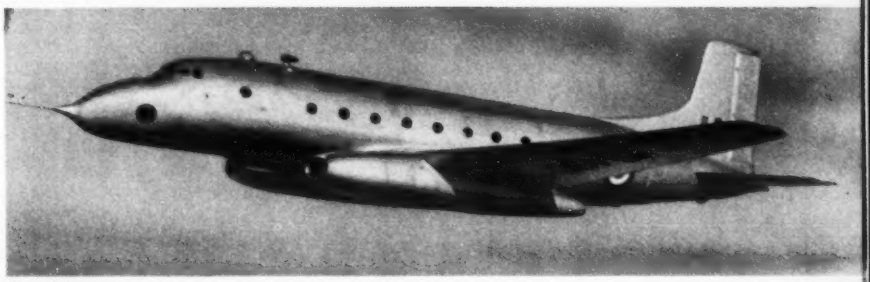
Research and Projects

Fairey F.D.1.



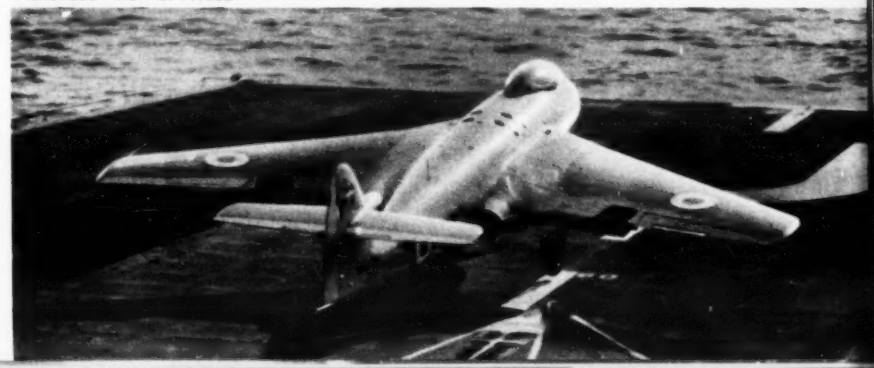
Fairey V.T.O. model.

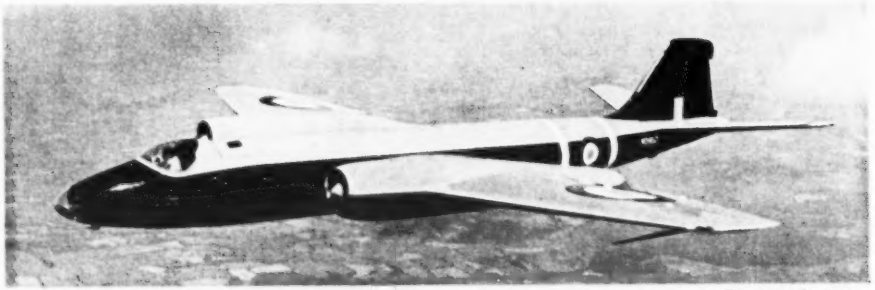
IN previous pages we have described not only standard types of British aircraft, and some of the more interesting projects, but certain research machines—the delta-wing Avro 707s, the Boulton Paul P.111A, and the Short S.B.5, with its adjustable sweepback. Here are depicted some additional types of research and development aircraft and two projects. Pride of place is accorded one of the first flying photographs of the **Fairey F.D.1** delta-wing research machine designed "for important research work with revolutionary possibilities in the design and operation of fighter aircraft." Alongside it is a view of the **Fairey V.T.O.** (vertical take-off) model on the Woomera rocket range. The relationship between this and the F.D.1 will be instantly apparent. The massive machine on the right is the **Avro Ashton** high-altitude research aircraft, six examples of which are being used by the Ministry of Supply; below it is the "navalized" **Hawker P.1052,** from which, as from a similarly adapted version of the Vickers-Supermarine 510, valuable experience in the operation of swept-wing aircraft from the decks of aircraft carriers has accrued. The **Olympus-Canberrra** below is that which achieved the world's height record of 63,668ft on May 4th this year, and the homelier-looking machine under it is an Avro **Lincoln** adapted as a test-bed for the Napier Nomad compounded engine which is installed in the nose. This machine is representative of several other Lincolns and Lancasters performing similar duties. Likewise a flying test-bed is the **Gloster Sapphire-Meteor** on the right, which possibly has the highest rate of climb of any turbojet aircraft in the world. The sketch of the twin-engined aircraft depicts the **Accountant,** a project by Aviation Traders, Ltd., for a Dakota replacement to be powered with Rolls-Royce Darts or Armstrong Siddeley Mambas. Finally, we show an impression of the **Folland Gnat** light fighter, concerning the capabilities of which warm discussion has been rife during the past year.



Avro Ashton.

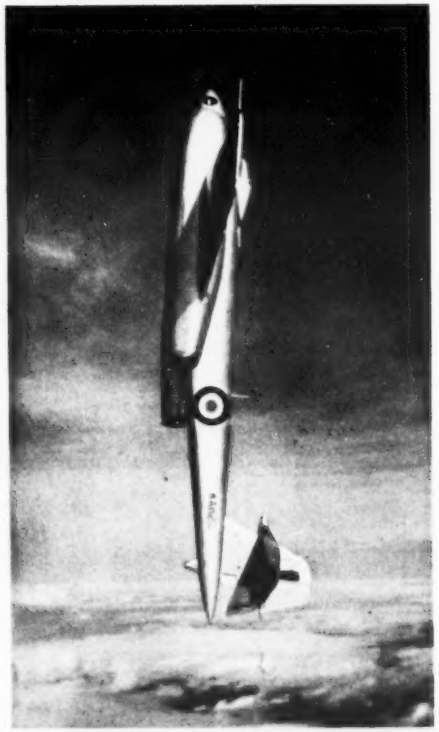
"Navalized" Hawker P.1052





Olympus-Canberra.

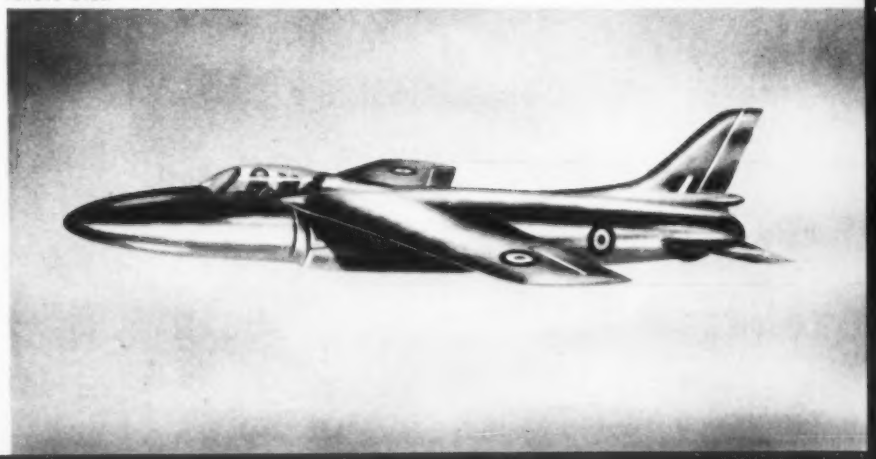
Nomad-Lincoln.



Sapphire-Meteor.

Aviation Traders Accountant.

Folland Gnat.



BRITISH AIRCRAFT 1953

Sailplanes and Gliders

Olympia Eon

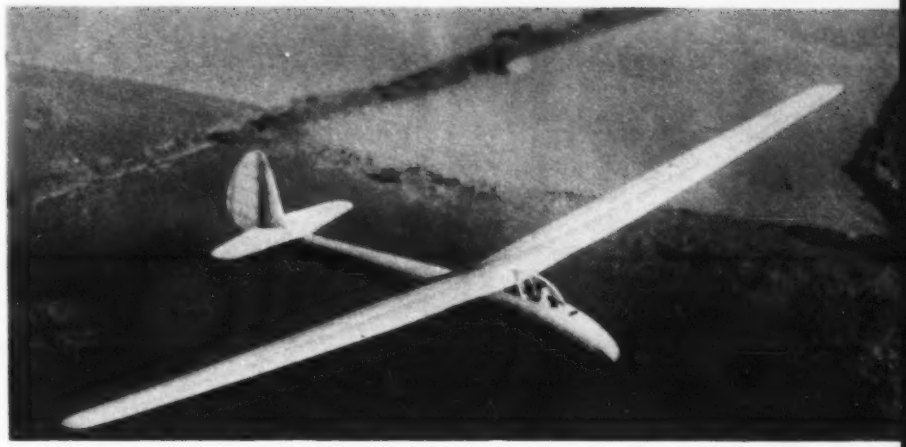
THE Olympia was of German origin, but after the war Elliotts of Newbury, Ltd., transposed the whole design into English dimensions and standards—a major undertaking. The type has since seen considerable service in gliding clubs and is still one of the most widely used and successful high-performance sailplanes. Of wood and fabric construction, the wing is fully cantilever, and the fuselage is of plywood-covered semi-monocoque construction. The undercarriage is of wheel-and-skid type, fitted for both aero-tow and winch launching. Many a graceful and silent aerobatic display has been given in the Olympia and several gliding records have been made in it. Its span is 49ft 2½in and length 23ft 10in.

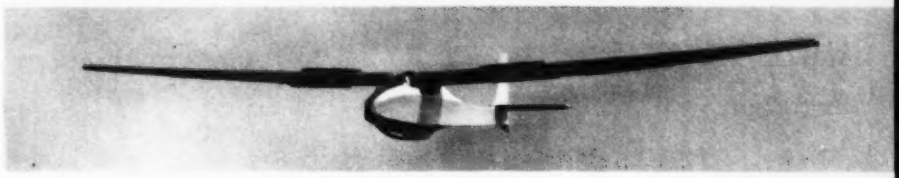
Slingsby Skylark

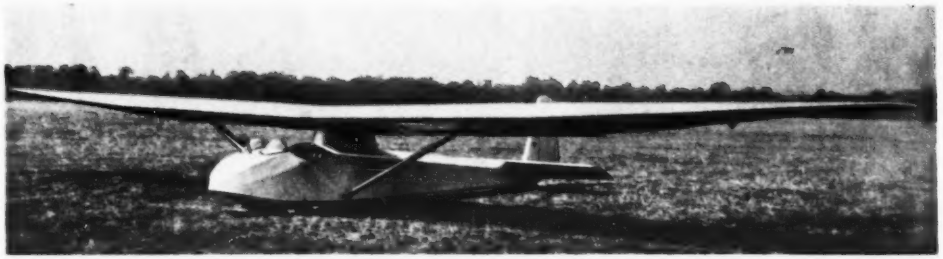
THE new Slingsby Type 37 Skylark is a small brother to the already famous Sky, and shows great promise as a high-performance sailplane. It has a relatively small wing span which gives it a very high rate of roll, and the scissor-type airbrakes are highly effective. The angular fuselage of the first prototype is replaced on production models by an oval-section plywood-covered structure, the nose cap of which will be made of moulded Fibreglass and Marco resin. This material combines lightness with ample strength. The tailplane and fin are plywood-covered, as is almost the whole of the wing surface; laminar flow is thus maintained as far as possible over the chord of the wing. This structure itself is, unusually, made up of a detachable centre and two outer panels, all nevertheless easy to assemble. To save weight and cost no landing wheel is fitted; A.S.I., altimeter, electric turn-and-slip indicator and variometer are standard as well as provision for a barograph behind the cockpit. Span is 44ft 10½in, a.u.w. 620 lb; best gliding angle is 1 in 27.3.

Slingsby Sky

THE Slingsby Type 34 Sky first appeared in public at the National Gliding Championships at Camphill (Derbyshire) in July 1951, and since then has gained for itself a fine reputation. In 1952, in Spain, Mr. Philip Wills won the World Gliding Championships in a Sky. With a wing span of 18 metres (60ft) its best gliding angle is 1 in 30 and its minimum rate of sink 2 ft/sec at 42 m.p.h. At 65 m.p.h. the gliding angle is 1 in 22, which makes it particularly suitable for cross-country soaring. A skid and single wheel undercarriage with a tail skid are fitted. In each dive-brake assembly the movement of the bottom brake, which opens with the flow, assists that of the top brake, which acts in the opposite sense. The final decision as to instruments and equipment is left to the customer, the weight allowance being sufficient to cater for the most luxurious taste. Span is 59ft, length 25ft 4 in, tare weight 550 lb, and max. all-up weight 800 lb.

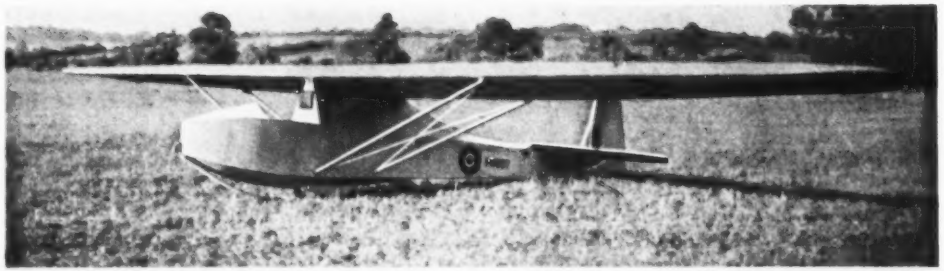






Slingsby T-21B Sedbergh

THE T-21B is one of two dual-training gliders produced by Slingsby Sailplanes, Ltd., and put into service with the A.T.C. and civilian gliding clubs. Designed specifically for their use, the T-21B offers the advantages of a dual *ab initio* trainer as well as having a good performance. The side-by-side cockpit has been arranged so that all controls are ready to the hands of both pilots, and visibility is good; small individual wind-shields give the cover necessary during aero-tow. The forward portion of the fuselage is of plywood stressed skin construction; the rearward diagonally braced and fabric covered. The wing is of the plywood-covered, single-spar, torsion-resisting nose-box type, the section aft of the spar being fabric covered; a single strut braces the wing from the main spar to the fuselage. A well in the floor of the cockpit allows instructor or pupil to rest his feet while not flying the aircraft. Lift spoilers are fitted. Span is 54ft and wing area 260 sq ft.



Slingsby Kirby Tutor

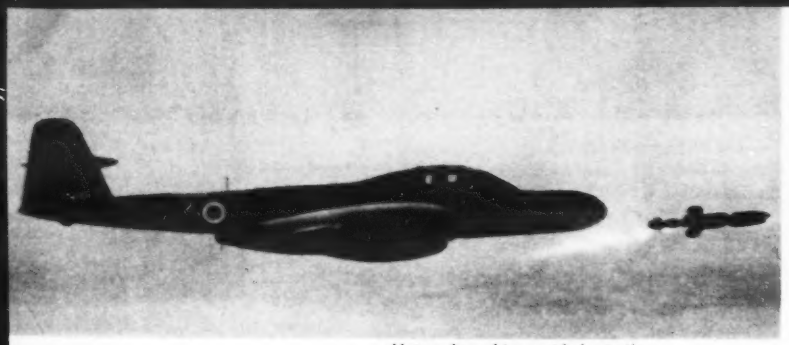
THIS single-seat intermediate glider is very manœuvrable and is capable of good soaring performance. Its high reserve strength factor, particularly in the wing, is a great advantage for training purposes. The type was developed from the Kirby Cadet by the redesign of the wing to give a higher aspect-ratio and by the use of a differential mechanism in the aileron control circuit. Many Tutor parts are interchangeable with those of the Cadet, which is itself seeing widespread service with the R.A.F. The latest type Tutor II is fitted with a parachute box behind the pilot's seat and is, therefore, suitable for aero-tow and cross-country flying. The type is, in fact, equivalent to the Grunau Baby II, but has the advantages of lower cost, great strength and considerable spares backing from Cadet and Tutor stocks. Span is 43ft 3¼in, and length 20ft 10in; tare weight is 340 lb.

Slingsby T.31 Tandem Tutor

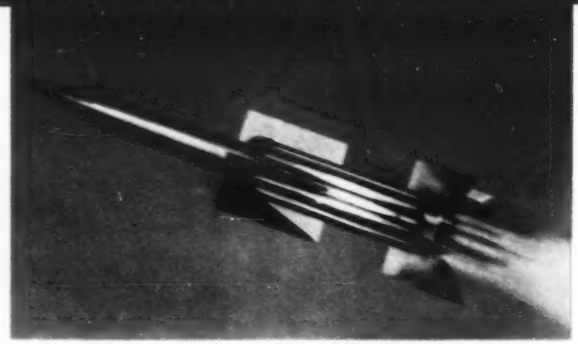
KNOWN in the R.A.F. as the Cadet 3, this is a dual-control glider for elementary instruction. The introduction of dual control has already shown good results both in safety and improved standard of training, and instructors no longer tend to remain on the ground as they did in the days of single-seat basic trainers. The Tandem Tutor was developed from the single-seat Kirby Tutor, and the wings and tail unit of the latter, having a high reserve strength factor, have been utilized for the Tandem verson. Skids, wheel, seats and many other structural members are interchangeable between the two types, thus reducing the price of the Tandem Tutor. An A.S.I. and a sensitive altimeter are fitted for the instructor in the rear cockpit. Two hooks, one for aero-tow and one for winch launching are fitted, and 5-to-6 minute instructional flights in still air from a winch launch are possible. A Tutor fuselage and wing struts can be fitted to Tandem Tutor wings to convert it into a single-seat glider. Span is 43ft 3¼in, wing area 170 sq ft, tare weight 389 lb.

BRITISH AIRCRAFT 1953

(Missiles and Targets)



Meteor launching guided missile.



British missile on test.

Guided Missile Development

NUMEROUS sections of British industry are devoting a great deal of energy to the development of guided missiles for various purposes. Most of their work is naturally subject to stringent security regulations, and in face of a stream of photographs and other publicity released from America, Britain's effort appears deceptively insignificant. Very few pictures indeed have been released in this country, and only the most general official statements have been issued. The existence of test ranges at Aberporth, in Wales, and Woomera, in Australia, has been common knowledge for a considerable time, and some of the companies engaged on guided missile work have been named. These include Bristol, English Electric, Fairey, the Propeller Division of de Havilland, and certain members of the Hawker-Siddeley Group. A recent statement by Mr. Duncan Sandys, the Minister of Supply, has made reference to British missiles capable of more than 2,000 m.p.h. at heights above 50,000ft. The same statement referred to missiles of the "beam-riding" and "homing" types and to the use of plastics for construction.

A.S.T. Towed Target-Glider

DESIGNATED C.4, this is a high-speed gunnery-target with a span of 25ft and capable of high sub-sonic speeds. The delta-form centre-section is bounded by two swept fins, and outboard of these are two swept rectangular wing panels. A small fuselage provides an aiming datum for the attacking aircraft and houses sundry equipment, including a radar responder, if required, and a firing error indicator unit. The undercarriage is of tricycle type, the bases of the fins housing outboard wheels which, when they touch down on landing, cause a braking parachute to open. The airframe is a metal shell with a Sebalkyd filling.

M.L. Radio-controlled Target

PRODUCED to an M.o.S. specification, this little machine is a very manoeuvrable pilotless target for anti-aircraft gunnery, radar-plotting practice, or similar duties. A high-wing monoplane, it has twin fins but no rudders. The power unit is a modified Vincent Picador engine driving a two-blade wooden airscrew. The span is 12ft, the length 12ft 6in, and the weight 42 lb. Performance is remarkably good—a sea level speed of 230 kt and at 10,000ft, 190 kt. Launching is effected from an "easel" with the aid of rockets, and when these fall away at about 125 kt an automatic pilot controls flight. Into this autopilot are then fed radio control-commands. In the event of radio contact being lost, the engine failing, or it being desired to land the aircraft, a parachute, flotation bag and shock-absorber bag are automatically brought into play, and the engine, if still running, is cut. Each target has a life of 10 hr and a flight endurance of 45 min.

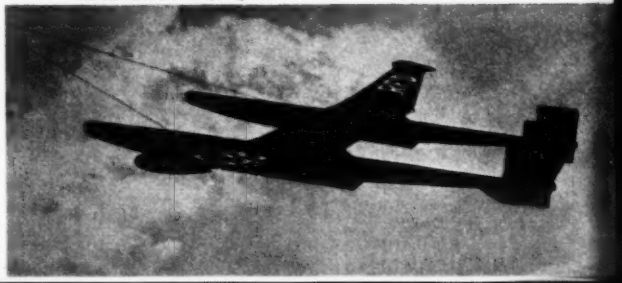
R.F.D. Towed Target-Glider

A HIGH-WING monoplane of 26ft span and 75 sq ft wing area, the R.F.D. Mk 1 winged target has twin fuselages and three fixed fins. It was designed for both ground-to-air and air-to-air practice, and is made up of interchangeable components of resin-bonded birch plywood on a spruce and pine structure. Resistance to damage from heavy-calibre ammunition is good. The target can be towed off and landed either on grass or concrete, the landing being made by towing it on to the ground, when a trigger skid under the mainplane centre-section releases the tow-lines and causes a 6ft tail parachute to deploy.

A.S.T. towed target-glider.

M.L. radio-controlled target.

R.F.D. towed target-glider.



BRITISH MILITARY AIRCRAFT, 1953

(INCLUDING RESEARCH TYPES)

Maker and Type	Main Duties	Span	Length	Power Unit(s)			Normal a.u.w.	Wing Loading	Armament (see note 2)			Max. speed		Climb		Typical Range
				No.	Type	Power (see note 1)			Guns No. Cal. mm	Bombs No. Wt. lb	R.P.s No. Wt. lb					
		ft in	ft in				lb	lb/sq ft				m.p.h.	ft	to ft	min	miles
Armstrong Whitworth:																
Meteor N.F.11 and N.F.13	F.	43 0	48 6	2	Derwent	n.r.	n.r.	n.r.	4 20	nil	nil	n.r.	n.r.	n.r.	n.r.	n.r.
Auster:																
Auster A.O.P.6	O.C.	36 0	23 2	1	Gipsy Major 7 or 8	145	2,210	11.9	nil	nil	nil	123	1,000	i.r.c.	810 ft/min	345
Auster T.7	T.O.C.	36 0	23 2	1	Gipsy Major 7 or 8	145	2,210	11.9	nil	nil	nil	123	1,000	440 ft/min	at 5,000 ft	290
Auster A.O.P.9	O.C.	36 9	23 8½	1	Bombardier 203	185	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Avro:																
Vulcan B.1	B.	n.r.	n.r.	4	Sapphire	n.r.	n.r.	n.r.	nil	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Shackleton M.R.2	R.A.-S.	120 0	87 4	4	Griffon	n.r.	n.r.	n.r.	4 20	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
707A	R'ch.	34 2	34 4	1	Derwent	n.r.	n.r.	n.r.	nil	nil	nil	n.r.	n.r.	n.r.	n.r.	n.r.
Avro Canada:																
CF-100	F.	52 0	52 6	2	Orenda	n.r.	n.r.	n.r.	Guns or rocket projectiles			n.r.	n.r.	n.r.	n.r.	n.r.
Blackburn and General Aircraft:																
Beverley C.1	Tt.	162 0	99 2	4	Centaurus	n.r.	n.r.	n.r.	nil	nil	nil	n.r.	n.r.	n.r.	n.r.	n.r.
Boulton Paul:																
Balliol T.2	T.	39 4	35 1½	1	Merlin 35	1,280	8,410	33.64	1 7.7	8 25	4 60	288	9,000	10,000	6	670
Sea Balliol T.21	T.	39 4	35 1½	1	Merlin 35	1,280	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
P.111A	R'ch.	33 6	26 1	1	Nene	n.r.	n.r.	n.r.	nil	nil	nil	n.r.	n.r.	n.r.	n.r.	n.r.
de Havilland:																
D.H. 110	F.	n.r.	n.r.	2	Avon	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Venom F.B.1	F.B.	41 8	31 10	1	Ghost	n.r.	n.r.	n.r.	4 20	2 1,000	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Venom N.F.2 and N.F.3	F.	41 8	35 3	1	Ghost	n.r.	n.r.	n.r.	4 20	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Sea Venom N.F.20	F.	41 8	35 3	1	Ghost	n.r.	n.r.	n.r.	4 20	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Vampire N.F.10	F.	38 0	34 7	1	Goblin 3	3,350	13,100	50	4 20	nil	nil	538	s.l.	34,000	17.4	1,220
Vampire T.11	T.	38 0	34 7	1	Goblin 3	3,350	11,030	42.1	4 20	opt.	8 25	537	s.l.	30,000	9.8	800
Chipmunk	T.	34 4	25 8	1	Gipsy Major 10	145	2,000	11.56	nil	nil	nil	138	s.l.	10,000	14.5	292
English Electric:																
Canberra	B.R.T.	64 0	65 6	2	Avon	n.r.	n.r.	n.r.	nil	n.r.	nil	n.r.	n.r.	n.r.	n.r.	n.r.
Fairey:																
Firefly 5	R.A.-S.	41 2	37 11	1	Griffon 74	2,020	16,096	48.15	4 20	2 1,000	16 60	386	14,000	10,000	6.9	760
Firefly A.S.7 and T.7	A-S.T.	44 6	38 3	1	Griffon	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Gannet A.S.1	A-S.	54 4	43 0	1	Double Mamba	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
F.D.1	R'ch.	19 6½	26 3	1	Derwent	n.r.	n.r.	n.r.	nil	nil	nil	n.r.	n.r.	n.r.	n.r.	n.r.
Gloster:																
Javelin F.A.W.1	F.	n.r.	n.r.	2	Sapphire	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Meteor P.V.	F.B.	41 0	44 7	2	Derwent 8	7,000	22,000	62.8	4 20	4 1,000	24 95	585	10,000	20,000	6.4	350
Meteor T.7	T.	37 2	43 6	2	Derwent 8	7,000	14,000	40	nil	nil	nil	580	s.l.	30,000	5.6	730
Meteor F.8	F.B.	37 2	44 7	2	Derwent 8	7,000	15,700	44	4 20	2 1,000	16 95	595	10,000	40,000	11.4	690
Meteor F.R.9	F.R.	37 2	43 6	2	Derwent 8	7,000	15,660	44	4 20	nil	nil	595	10,000	40,000	11.4	690
Meteor P.R.10	R.	43 0	44 3	2	Derwent 8	7,000	15,330	40	nil	nil	nil	575	10,000	40,000	10	1,400
Handley Page:																
Victor B.1	B.	n.r.	n.r.	4	Sapphire	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Hastings C.2	Tt.	113 0	82 1	4	Hercules 106	6,700	80,000	56.8	nil	nil	nil	348	22,200	10,000	11	2,000
Marathon 1A, Series 103	T.	65 0	52 1½	4	Gipsy Queen 70-4	1,360	17,535	35.25	nil	nil	nil	—	—	10,000	14	1,290
Hawker:																
Hunter F.1 and F.2	F.	33 8	45 3	1	Avon (F.1) Sapphire (F.2)	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Sea Hawk F.1	F.	39 0	40 0	1	Nene 4	n.r.	n.r.	n.r.	4 20	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Percival:																
Provost T.1	T.	35 2	29 0	1	Leonides 25	550	4,400	20.6	2 7.7	8 25	6 25	200	2,300	10,000	7	630
Pembroke C.1	Tt. T.	64 6	46 0	2	Leonides	1,100	13,000	32	nil	nil	nil	220	2,000	10,000	10.5	1,030
Sea Prince T.1	T.	56 0	46 4	2	Leonides 25	1,100	11,850	32.5	nil	nil	nil	223	2,000	5,000	5.7	530
Short:																
S.A.4	R'ch.	109 0	102 2	4	Avon	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
S.B.5 (see note 3)	R'ch.	30 6	47 4	1	Derwent	n.r.	n.r.	n.r.	nil	nil	nil	n.r.	n.r.	n.r.	n.r.	n.r.
Vickers-Armstrongs:																
Valiant B.1	B.	114 4	108 3	4	Avon	n.r.	n.r.	n.r.	nil	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Type 1000	Tt.	n.r.	n.r.	4	Conway	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Varsity T.1	T.	95 6	67 6	2	Hercules 264	3,900	37,500	38.5	nil	24 25	nil	290	5,000	10,000	7.5	1,500
Valetta C.1	Tt.	89 5	63 2	2	Hercules 230	3,950	36,500	41.3	nil	nil	nil	291	10,000	max. r.o.c.	1,500 ft/min as above	1,460
Valetta T.3	T.	89 5	65 3	2	Hercules 230	3,950	36,500	41.3	nil	nil	nil	291	10,000			1,410
Vickers-Supermarine:																
Swift F.4	F.	32 4	41 6	1	Avon	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Type 508	F.	41 0	50 0	2	Avon	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Attacker F.B.2	F.B.	36 11	37 6	1	Nene 102	5,000	11,750	52	4 20	2 1,000	8 60	583	s.l.	30,000	7.1	1,190
Westland:																
Wyvern S.4	Strike	44 0	41 10	1	Python	n.r.	n.r.	n.r.	4 20	2 1,000	16 65	n.r.	n.r.	n.r.	n.r.	n.r.

Abbreviations: A-S. anti-submarine; a.u.w. all-up weight; B. bomber; C. communications; F. fighter; i.r.c. initial rate of climb (ft/min); n.r. not released; O. observation; R. reconnaissance; R'ch. research; r.o.c. rate of climb; R.P. rocket projectile; s.l. sea level; T. training; Tt. transport.
Notes: (1) For piston engines, power (in h.p.) is for take-off; for turbojets, thrust (in lb) is static. (2) Bomb and R.P. loads are generally alternatives. (3) Dimensions are for 60 deg sweepback.

BRITISH CIVIL AIRCRAFT, 1953

(INCLUDING TYPES NOT YET UNDER CONSTRUCTION)

Maker and Type	Span	Length	Power Unit(s) No.	Power Unit(s) Type	Power Unit(s) Power (see note 1)	Normal a.u.w.	Wing Loading	Max. Disposable Load	Volumetric Payload Capacity	No. of Pass.	Cabin Air (see note 2)	Max. Still-Air Range	Typical Performance Range	Typical Performance Height	Typical Performance Speed	Typical Performance Payload	Take-off to 50ft (I.C.A.N.)
	ft in	ft in				lb	lb/sq ft	lb	cu ft			miles	miles	ft	m.p.h.	lb	yd
Airspeed:																	
Ambassador	115 0	82 0	2	Centaurus 661	5,200	52,500	43.7	16,276	2,540	36/47	P.	1,660	1,220	20,000	242	7,600	1,140
Auster:																	
Cirrus Autocar	32 0	23 2	1	Cirrus Major 3	140	2,450	13.3	1,091	62	3	—	—	520	1,000	110	650	380
Aiglet Trainer	32 0	23 2	1	Gipsy Major 1	120	1,850	11.3	877	—	1/2	—	—	275	1,000	109	—	330
Ambulance/ Freighter	37 0	24 8	1	Bombardier 702	162	2,700	14.2	890	—	3/4	—	—	280	2,000	103	580	490
Avro:																	
Atlantic	121 0	145 0	4	Olympus (?)	—	200,000	—	45,000	7,820	94/131	P.	6,000	—	45,000	600	—	2,000
Blackburn:																	
Universal Mk 2	162 0	99 7	4	Centaurus 173	11,400	130,000	46.4	55,766	7,100	130	—	3,680	200	8,000	180	46,300	1,180
Universal	162 0	99 7	4	Turbo-Cyclone	13,000	145,000	49.8	66,064	7,100	130	—	—	200	8,000	193	55,000	1,390
Bristol:																	
Britannia 100	140 0	14 0	4	Proteus 705	15,000	140,000	68	70,575	—	63/93	P.	6,300	3,200	27,000	355	25,000	1,170
Britannia 300	140 0	124 3	4	Proteus 750	16,400	155,000	75.5	74,580	6,627	60/104	P.	note 3	3,400	30,000	385	30,000	1,915
Type 170, Mk 31E	108 0	68 4	2	Hercules 734	3,960	44,000	30	14,617	2,360	44	—	1,730	850	5,000	166	10,000	825
Type 170, Mk 32	108 0	73 6	2	Hercules 734	3,960	44,000	30	12,200	3,000	(note4)	—	1,730	850	5,000	166	8,352	825
De Havilland:																	
Comet, Series 1	115 0	93 0	4	Ghost 50	20,000	107,000	53	56,000	2,478	36/44	P.	3,540	1,500	38,000-42,000	490	12,500	—
Comet, Series 2	115 0	96 0	4	Avon	26,000	120,000	59.5	64,000	—	—	P.	4,200	(note 5)	38,000-42,000	500	13,500	—
Comet, Series 3	115 0	111 0	4	Avon	36,000	145,000	—	—	—	58/76	P.	4,800	(note 6)	45,000	500	17,365	—
Dove, Series 5	57 0	39 3	2	Gipsy Queen 70, Mk 2	760	8,800	26.3	2,420	392	8/11	—	1,153	500	8,000	179	1,684	770
Heron, Series 2	71 6	48 6	4	Gipsy Queen 30, Mk 2	1,000	12,500	25.6	—	586	14/17	—	note 7	690	8,000	183	2,400	750
Beaver, Series 2	48 0	30 3	1	Leonides	550	5,100	20.4	2,010	144	4/6	—	1,162	782	5,000	138	1,000	340
Otter	58 0	42 0	1	Wasp	600	7,200	18.9	3,035	311	8/14	—	1,080	500	5,000	139	2,040	366
Handley Page:																	
Hermes IV	113 0	96 10	4	Hercules 763	8,400	86,000	61.1	30,650	3,754	40/74	P.	3,430	2,873	10,000	267	6,349	1,362
H.P. 97	—	—	4	Sapphire (?)	—	—	—	—	—	94/150	—	—	—	—	—	—	—
Handley Page (Reading):																	
Marathon 1A	65 0	52 1½	4	Gipsy Queen 70, Mk 4	1,360	18,000	36.14	5,972	1,010	18/20	—	1,020	940	5,000	167	3,740	920
Percival:																	
Prince Series III	56 0	42 10	2	Leonides 24	1,100	11,000	30.2	3,190	620	8/12	—	1,107	650	5,000	151	1,660	800
Saunders-Roe:																	
Princess	219 6	148 0	10	Proteus	35,000	330,000	65.7	137,000	13,500	105	P.	5,500	5,500	37,000	380	19,500	—
Scottish Aviation:																	
Pioneer Mk II	52 9½	34 6	1	Leonides 501/4	520	5,400	13.8	1,300	80	4	—	425	400	5,000	120	850	230
Twin Pioneer	76 6	45 1	2	Leonides 502/1	1,100	13,500	20.5	4,425	—	14/16	—	620	565	5,000	139	3,008	342
Short:																	
Sealand Mk I	61 6	42 2	2	Gipsy Queen 70, Mk 4	690	9,100	25.4	1,868	410	5/8	—	950	600	5,000	127	935	(note 8)
Vickers-Armstrongs:																	
Viscount 700	93 8½	81 2	4	Dart RDa 3	6,040	58,500	60.75	25,425	2,474	48/62	P.	2,030	1,100	20,000	300	11,900	1,600
Viscount 800	93 8½	94 6	4	Dart RDa 5	6,760	65,000	67.5	25,888	3,132	66/82	P.	1,400	350	16,000	290	16,100	1,830
V.C.7	140 0	146 0	4	Conway	—	—	—	—	—	100/150	P.	—	—	—	—	—	—

Notes: (1) For piston engines, power (in h.p.) is for take-off; for turboprops, an equivalent brake horsepower is given; for turbojets, thrust (in lb) is static. (2) P = pressurized. (3) 5,100 miles with full tanks and payload. (4) 20 passengers in addition to three cars. (5) Stage-lengths intended for Comet 2: 1,750-2,200 miles. (6) Stage-lengths intended for Comet 3: up to 2,500 miles. (7) Max. stage-length: 1,390 miles. (8) 750 yd land, 1,020 yd water.

HELICOPTERS

Maker and Type	Main Rotors	Rotor Diam.	Fuselage Length	Power Unit(s) No.	Power Unit(s) Type	Power Unit(s) Power	a.u.w.	Disc Loading	Disposable Load	No. of Pass.	Typical Performance Range	Typical Performance Height	Typical Performance Speed	Typical Performance Payload
		ft in	ft in			h.p.	lb	lb/sq ft	lb		miles	ft	m.p.h.	lb
Bristol:														
Type 171 Mk 4 (Sycamore)	1	48 6.7	42 0	1	Leonides Le.23 H.M.V.	545	5,300	2.86	1,380	3/4	270	s.l.	91	706
Type 173 Mk 1	2	48 6.7	55 1.7	2	Leonides Le.23 H.M.V. Mk 73	1,090	10,600	2.86	2,800	10	100	2,500	85	1,200
Type 173 Mk 3	2	48 6.7	—	2	Leonides Major	1,740	13,500	3.64	3,760	14		See note 1		
Saunders-Roe:														
Skeeter	1	32 0	28 5	1	Bombardier	180	2,100	2.6	624	1		See note 2		
Westland-Sikorsky:														
S-51 (Dragonfly)	1	48 0	41 1½	1	Leonides 521/1	520	5,700	3.15	1,470	3	200	up to 4,000	85	730
S-55	1	53 0	41 8½	1	Wasp R-1340	600	6,800	3.08	2,031	10/12	200	up to 6,200	80	1,000

Notes: (1) Max. speed is 153 m.p.h. approx; max. cruising speed, 138 m.p.h. approx; 16 passengers, with baggage, can be carried for a distance of 230 miles. (2) Max. speed is 115 m.p.h. and endurance 3 hr at 86 m.p.h.

BRITISH POWER UNITS 1953

IF a question were asked as to where the main strength of the British aircraft industry lies today, an appropriate answer would be "In its power units." In every important engine class except the very smallest there is at least one first-rate British product. Without being extravagant, the manufacturers or the Ministry of Supply have also made sure that an alternative is available for each design upon which depends an important military aircraft order.

It may be that some of our manufacturers still have something to learn about production, but no one knows more than they do about design and development. Fortunately for all, there is an excellent spirit of collaboration between rival companies and a remarkable interchange of technical knowledge and experience. That unique body, the Gas Turbine Collaboration Committee, does invaluable work in this connection.

Of the major units to be shown and demonstrated at Farnborough, more than usual will bear familiar names, examples having proved themselves over many hours in the air and on the test-beds. Most will show the benefits of tireless development and long experience and upon them now depends the success of our military re-equipment and turbine-transport plans.

But let it not be thought that British manufacturers feel inclined to rest on their laurels or that they are slow to break new ground. This year has seen the first announcement of the Rolls-Royce Conway by-pass turbojet, and of the most powerful new de Havilland unit, the Gyron. These are not just names; both have been running for months past. Where could one find the equal in its class of Armstrong Siddeley's new Viper, and what other can match the high-altitude performance of the Bristol Olympus? Without the sure power of the Rolls-Royce Avons and Armstrong Siddeley Sapphire the steady development of the Hunter, Swift, Javelin, D.H.110 and other new high-performance machines—including, especially, the V bombers and the Comet Series 2—would not have been possible.

British manufacturers have had less reason to hurry in bringing afterburners to the production stage than have foreign companies, because the basic engines have, generally speaking, been able to provide sufficient thrust to meet the airframe requirements. This year, however, the supersonic flight and the climb performances expected of the new fighters has resulted in the introduction of reheat as standard equipment. Also, to meet the ever-increasing power demands for aircraft and missiles, rocket and ramjet development has actively continued.

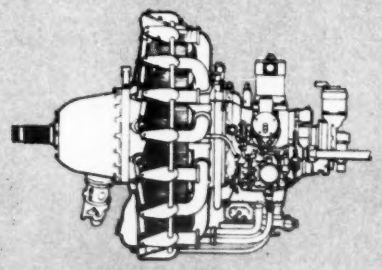
By inference, independent tribute to the excellence of British gas turbines continues to be paid as each unit to go into production becomes the subject of a foreign licensing agreement; several, for example, are now associated with the great manufacturing names of the American aircraft-engine industry.

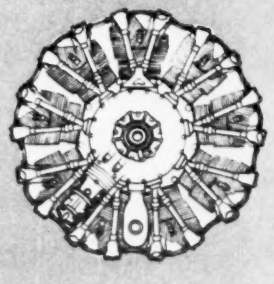
There follows a complete résumé of current British power units, together with illustrations and brief data, to serve as a guide to Farnborough visitors and for subsequent reference. Data tables complete this section.

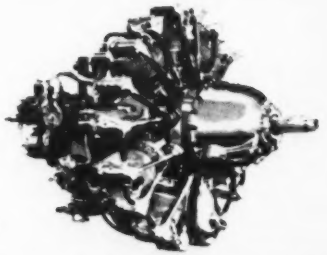
Alvis Leonides

GREAT artists, it is said, are seldom appreciated in their own lifetime. This cannot be true of an engine, but it was only after some years of patient development that the Alvis Leonides nine-cylinder radial came into its own. Over-emphasis on the all-embracing future of gas turbines and under-estimation of the power required for trainers and some feederliners helped to hold back its adoption. But those years have been put to good account so far as refinement of design is concerned, and now when it is most needed for fixed- and rotating-wing applications the units are available. The Leonides with vertical or horizontal mounting is accepted as *the* British helicopter and basic-trainer power source, and in addition it is used for several light transports.

Features of the Leonides geared and supercharged unit are its compactness, Hobson low-pressure fuel injection system, modern screened and waterproofed ignition, and adaptability to suit various accessory-drive demands. Provision is made for a c.s. fully-feathering airscrew. An overhaul period of 600 hours is authorized, and the specific consumption for maximum cruising is from 0.52 to 0.56 pt/b.h.p./hr.





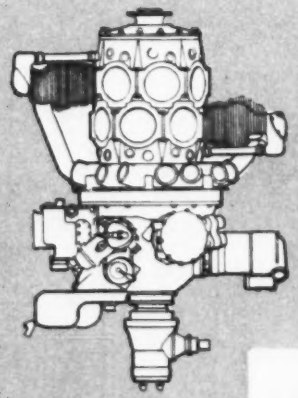


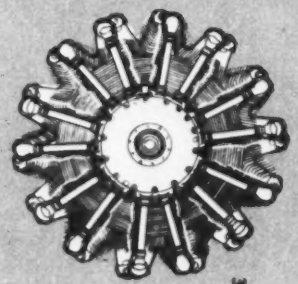
LEONIDES

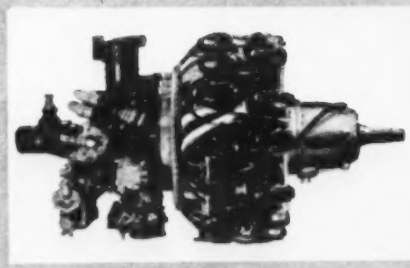
Diameter	
41.5in	105.4 cm
Length	
53 to 55in	134.6 to 139.7 cm
Weight	
770/790 lb	1956 kg/2006 kg
Maximum power	
540/570 h.p. ..	547/578 c.v.

Alvis Leonides Major

AMOUNTING to a 14-cylinder, two-row version of the Leonides, the Major is now under development for several possible helicopter and fixed-wing designs. Components of this 870 b.h.p. engine closely resemble—and are in some cases interchangeable with—those of the 9-cylinder unit. Geared (A.L.E.M.1-1) and ungeared (A.L.E.M.1-2) versions have been announced.

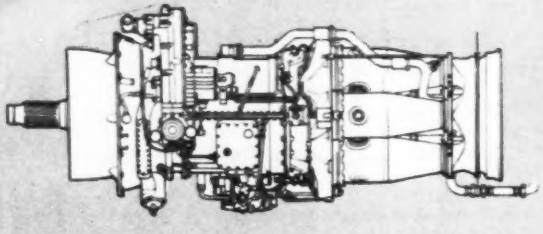


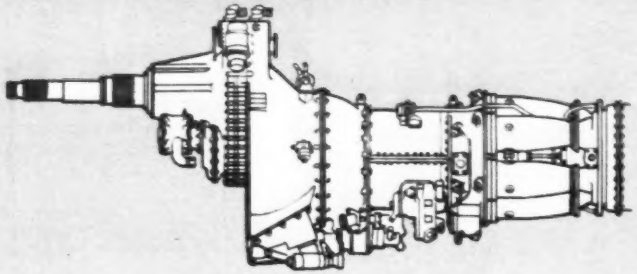


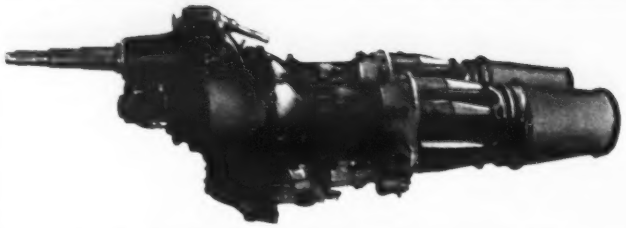


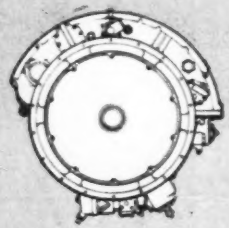
LEONIDES MAJORS

Diameter	
38.925in	98.8 cm
Length	
70.896/54.854in ..	180/139 cm
Weight	
1,060/960 lb ..	481/435 kg
Maximum power	
870 b.h.p. ..	882 c.v.



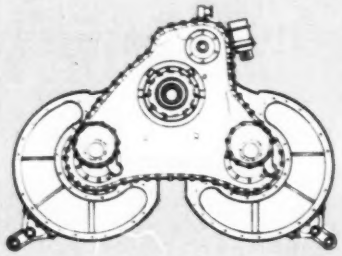






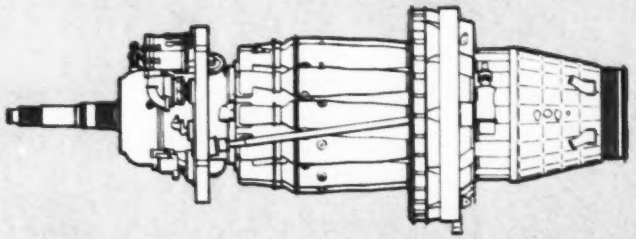
MAMBA

Diameter	29in	..	73.6 cm
Length	87.33in	..	221 cm
Weight	780 lb	..	353.8 kg
Maximum power	1,320 s.h.p.		1340 cv
	+405 lb		(184 kg)



DOUBLE MAMBA

Width	52.8in	..	134 cm
Height	48.85in	..	124 cm
Length	101.8in	..	258.5 cm
Weight	2,125 lb	..	963.8 kg
Maximum power	2,640 s.h.p.		2680 cv
	+810 lb		(367 kg)



BRITISH POWER UNITS 1953

Armstrong Siddeley Mamba and Double Mamba

WELL in advance of its time when introduced in 1946, the small-diameter axial Mamba turboprop has recently become even better known in its Siamese-twin form, the Double Mamba. In this engine, as fitted to the Fairey Gannet, each Mamba unit is separate and can run independently of the other, but the two share a common intake and reduction-gear casing. They drive separate co-axial contra-rotating airscrews.

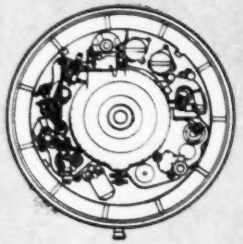
Double-Mamba-powered aircraft, such as the Gannet, enjoy twin-engine safety without suffering any of the assymetric problems of the conventional twin and, in addition, the practice would be to cruise on only one of the engines, thus prolonging the life of the other. The basic Mamba with a ten-stage axial compressor, six chambers with vaporizing fuel system and a two-stage turbine is still undergoing development. A 500-hr overhaul period is likely to be authorized shortly. Latest versions are the ASMa.5 of 1,460 e.h.p. and the ASMa.6 of which details are restricted. The Double Mamba counterpart of the 5 is the ASMD.3 of 3,120 e.h.p. Mambas can operate on wide-cut turbine fuels and diesel oil mixtures.

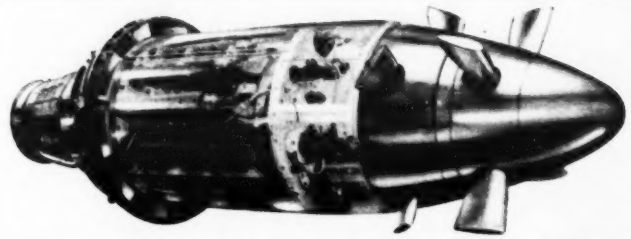
Armstrong Siddeley Python

VERY early in the field, the Python turboprop was for a long time the most powerful unit running. It was adopted for the Wyvern Naval strike aircraft and for this it is in production. There is a double reversal of flow through the engine: air entering at the back, moving forward through the 14-stage axial compressor, back again through the eleven combustion chambers and thence to the jet pipe through a 2-stage turbine. The fairly large diameter is off-set by the reduced length of such a design. As with other A.S. units, a vaporizing combustion system is employed. A contra-rotating airscrew absorbs the shaft power.

PYTHON

Diameter	54in	..	137 cm
Length	123.2in	..	312 cm
Weight	3,450lb	..	1560 kg
Maximum power	3,670 s.h.p.		3720 cv
	+1,180lb.	.	(535 kg)





Armstrong Siddeley Sapphire

ONE of the most important British high-powered turbojets, the A.S. Sapphire has an axial compressor of some dozen stages, a vaporizing annular combustion chamber and two turbine stages. No new power figure has been released, although the type-test figure of 8,300 lb for the ASSa.6 was established more than a year ago. Development work towards higher powers—with and without reheat—and for supersonic flight has been proceeding. The fuel and burner systems are designed to operate at moderate pressures, and attention has been given to the provision of rapid ("slam") acceleration. The specific consumption under cruising conditions is 0·85 lb/hr/lb.

Armstrong Siddeley Snarler

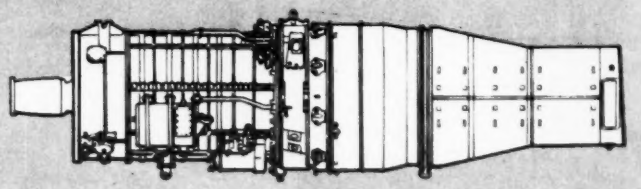
UNDER development since 1947, the Snarler is a "hot" rocket running on methanol/water mixture and liquid oxygen as the oxidant. A unit was successfully flight-tested in the Hawker P.1072 in November, 1950. The pilot's controls comprise only two switches, and the unit, giving 2,000 lb thrust, is intended for assistance to give rapid climb and to increase performance for short periods at very high altitude (where it maintains its full power). The Snarler is not self-sufficient, having no means of driving its own fuel-supply pumps—this provision will follow in later A.S. units as may the use, for convenience, of kerosine fuel in place of the methanol. Rocket motor designs of this kind—which are built to accepted aircraft engine standards—lend themselves readily to scaling-up for increased power. Specific consumption may be expressed for purposes of comparison as of the order of 1 lb/sec/200 lb thrust.

Armstrong Siddeley Viper (and Adder)

FOR convenience (or occasionally through lack of knowledge) the Adder is treated as the forerunner of the Viper. In fact, the two have very little in common. The Adder is now a design of the past and may be remembered as a pure turbojet derivative of the Mamba turboprop produced in small numbers to meet an urgent demand. It produced 1,050 lb thrust and weighed 580 lb.

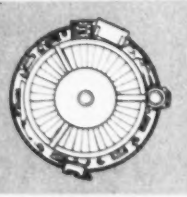
The Viper is an important new unit of which two distinct versions are under development: one intended to be expendable and therefore constructed of cheap short-life materials; the other for small piloted aircraft such as the Je. Provost. The short-life versions are the ASV.3 Mk 100 and the latest ASV.4 and ASV.6, giving respectively 1,750 lb and 1,900 lb thrust. For trainers and other piloted aircraft the ASV.5 has been produced; it gives 1,640 lb thrust.

Features of the Vipers are the ingenious simplicity and low weight. The small axial compressor has seven stages and gives a 3.5:1 compression ratio. The turbine is of single-stage type. A combination of Metrovick (ex Sapphire) and A.S. ideas has resulted in an excellent annular combustion chamber design, incorporating vaporizing burners as is the firm's custom.



SAPPHIRE ASSa.6

Diameter	37.4in	95 cm
Length	134in	340 cm
Weight	2,600 lb	1180 kg
Maximum thrust	8,000 lb	3650 kg

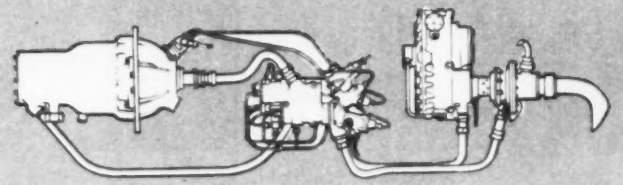


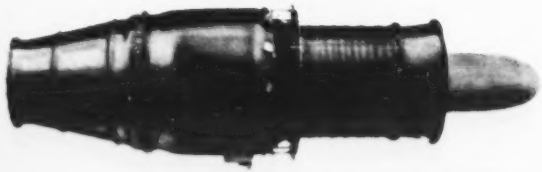
VIPER ASV.3

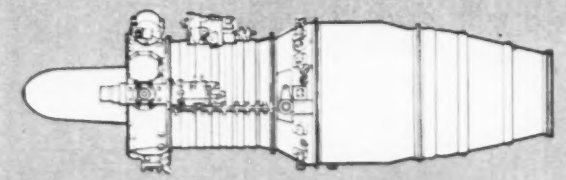
Diameter	23.25in	59 cm
Length	65.5in	166 cm
Weight	365 lb	165 kg
Maximum thrust	1,640 lb	740 kg

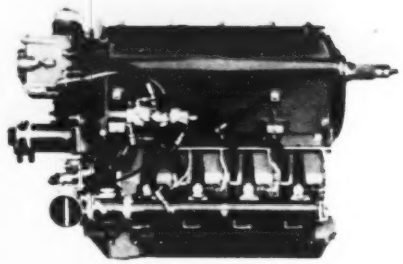
SNARLER ASSn.1

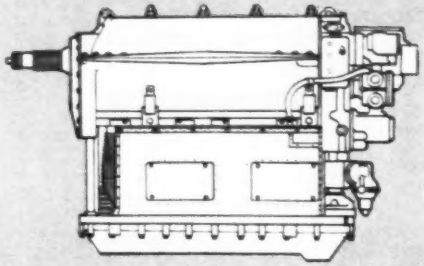
Main combustion chamber	12.5in	31.6 cm
Weight complete	215 lb	97.5 kg
Maximum thrust	2,000 lb	907 kg

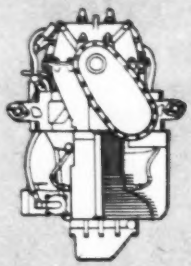






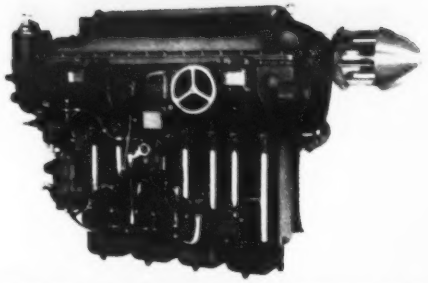






BOMBARDIER 702

Width	..	17.2in	43.2 cm
Length	..	46.8in	118.87 cm
Height	..	31.1in	79 cm
Weight	..	350 lb	159 kg
Maximum power	..	180 h.p.	182 c.v.



CIRRUS MINOR II

Width	..	18in	45.5 cm
Length	..	40in	101.3 cm
Height	..	25.5in	65 cm
Weight	..	234 lb	106 kg
Maximum power	..	100 h.p.	101 c.v.

BRITISH POWER UNITS 1953

Blackburn Bombardier

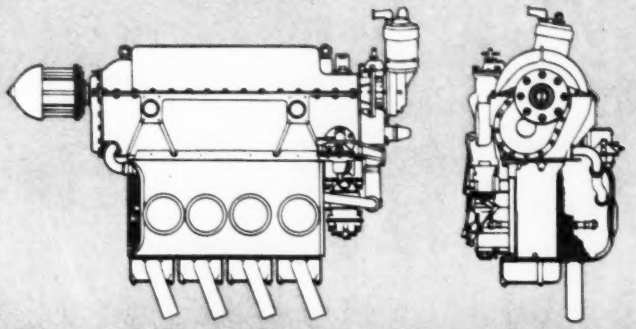
ONE of the most advanced designs in its class, the Blackburn Bombardier has two features which distinguish it from almost all other light piston engines—direct fuel injection and an under-head camshaft. Despite its relatively large power output—180 h.p.—for a four-cylinder in-line layout, it is smooth and responsive in operation from idling to full power. A military order for this engine ensures its continued development and availability for civil applications. A modern dual screened ignition system is provided and fixed-pitch or constant-speed airscrews may be employed. Consumption for w.m. cruising is 7 gal/hr. The swept volume is just over 6.5 litres. When the Bombardier was originally announced it was to have been the smallest of a new series with the Grenadier and Musketeer. Development of the other two has not been continued, although the Grenadier, a 300 h.p. six-cylinder unit, reached the type-test stage.

Blackburn Cirrus Major

NO important changes have been made in the Cirrus Major design since last year. A 150 h.p. four-in-line unit of conventional layout, it is in use in many parts of the world and has many years of experience and development behind it. The recommended overhaul period is 600 hours. It carries a full complement of accessories compactly grouped on the rear cover. The capacity is 6,330 c.c. and a representative cruising consumption figure is 7 gal/hr. The current Major III has a slightly increased compression ratio by comparison with the II which is rated at 5 to 7 h.p. less.

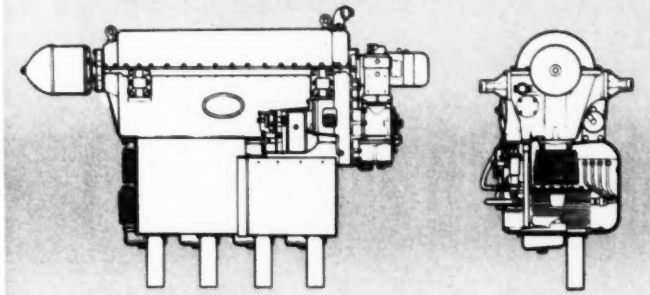
Blackburn Cirrus Minor

THIS 100 h.p. four-cylinder inverted engine has remained substantially unchanged for the last year or two, but has through its willing service (and demonstrations of continued reliability when considerably overstressed for racing) gained many new supporters. Its cruising consumption works out at about 4½ gal/hr; the capacity is 3,990 c.c. Leaded fuels may be used; on the other hand straight 73 octane fuel meets its requirements with standard compression ratio of 6¼ to 1. A cheap, long-life derated Minor has been considered in connection with the Royal Aero Club light aircraft design competitions. The 100 h.p. Cirrus Minor is normally equipped with electric starter and generator, and it has been approved for use with a v.p. airscrew should one become available for it.



CIRRUS MAJOR III

Width	..	17.7in	45 cm
Length	..	43in	109.6 cm
Height	..	31.3in	79.7 cm
Weight	..	333 lb	734 kg
Maximum power	..	155 h.p.	157 c.v.

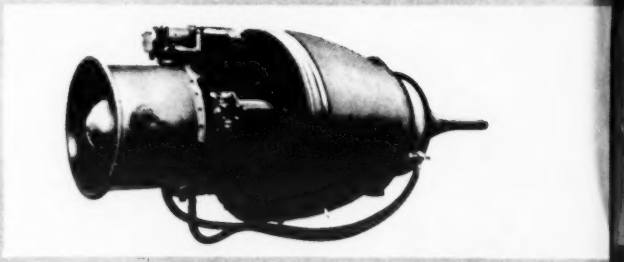


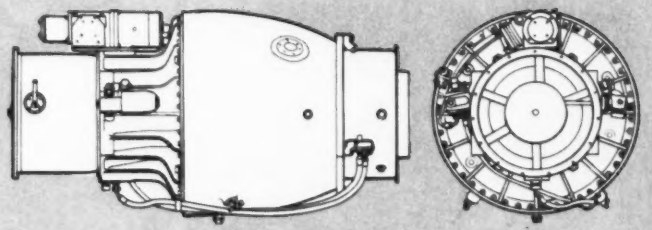
Blackburn-Turbomeca

VISITORS to Continental exhibitions will be familiar with the large range of turbojets, airscrew-turbines and other basically similar units produced by Turbomeca. They are covered by Szydlowski patents. The Blackburn-Turbomeca Division has been established to build several of these engines under licence in England. At Farnborough will be seen examples of the Palas and similar but larger Marboré turbojets and the Palouste air compressor closely related to the Palas. All Turbomeca units are built around a rugged single-stage centrifugal compressor and an annular combustion chamber with rotating-disc fuel distributor and burner. According to type, then, a single- or two-stage turbine is employed or two single-stage turbines of which the second may be free. Turboprops or compressors derive their shaft power either from a free turbine or from an extension of the unit's compressor shaft. Specific consumption figures range between 0.96 and 1.17 (except for the ducted fan Aspin II which gives a figure of 0.545.)

Bristol Olympus

LITTLE may as yet be said about the design details of the Bristol Olympus turbojet. It is a high-compression unit in which a form of compounding is employed to overcome attendant problems. The two axial compressors are quite separate mechanically and are driven respectively by a low- and a high-pressure turbine. From appearance the combustion system does not employ separate chambers. The aim, which has been realized, was to provide a high-powered turbojet with low fuel consumption and small frontal area. Power demands for starting the Olympus are low due to the separated turbine arrangement. Its very high altitude performance, including re-lighting, is unsurpassed. Specific consumption is 0.766 lb/hr/lb thrust. A feature of the two-spool Olympus is its readiness to accelerate very rapidly—in three seconds, in fact—from idling to full thrust. Units are currently being developed in a Canberra flying test-bed which recently ascended to 63,668ft, so gaining the world's altitude record. Olympus are to power the Vulcan bombers.



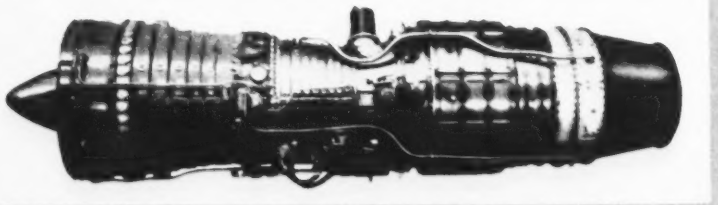


MARBORE II

Diameter	..	22.3in	56.5 cm
Length	..	43.1in	109.2 cm
Weight	..	309 lb	140 kg
Maximum thrust	..	883 lb	400 kg

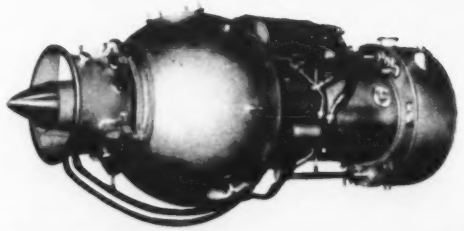
PALOUSTE

Diameter	..	18.66in	47.4 cm
Length	..	41.7in	106 cm
	..	19.67in	50 cm
Weight	..	187.5 lb	85 kg
Output	..	139 lb/min (at 41.2 lb/sq in, 15 deg C.)	



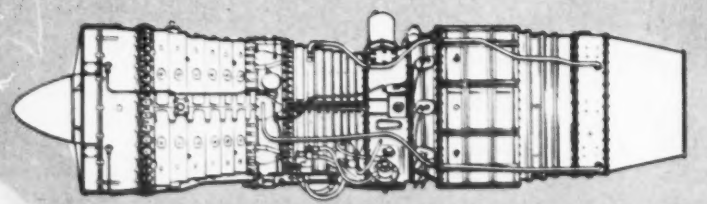
OLYMPUS

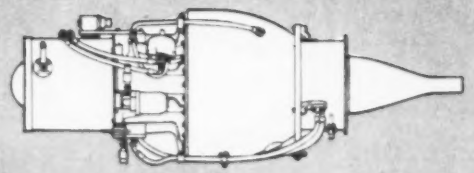
Diameter	..	40in	101.6 cm
Length	..	124.45in	316 cm
Weight	..	3,520 lb	1597 kg
Maximum thrust	..	9,750 lb	4427 kg

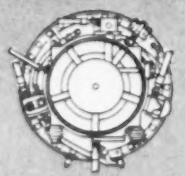


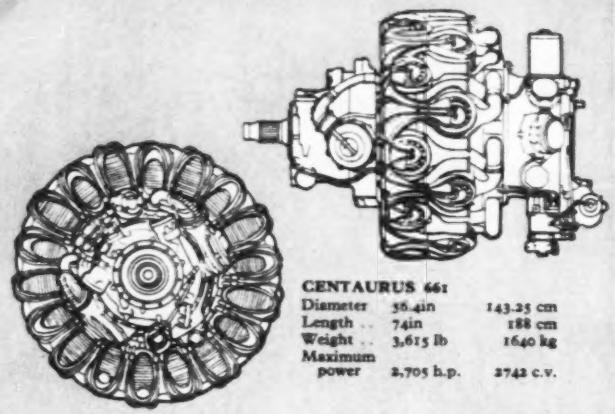
TURBOMECA PALAS

Diameter	..	15.95in	40.5 cm
Length	..	47.2in	119.8 cm
Weight	..	159 lb	72 kg
Maximum thrust	..	350 lb	158.7 kg



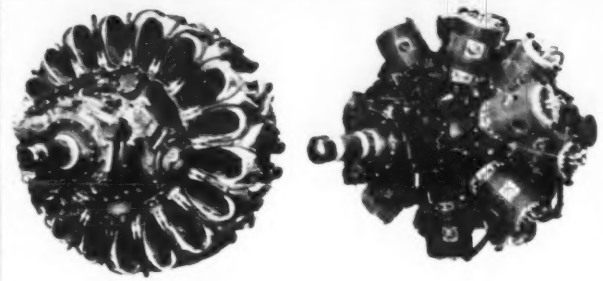


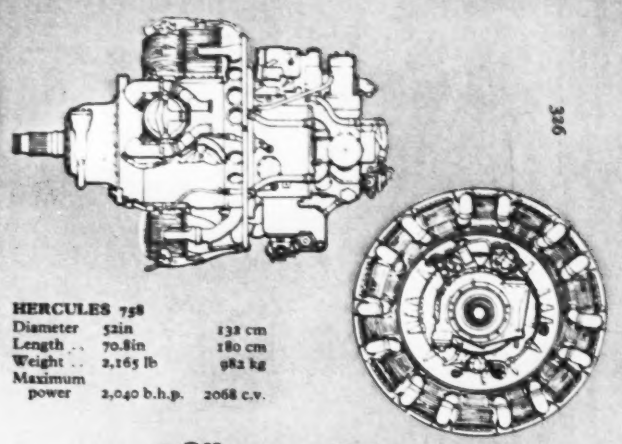




CENTAURUS 661

Diameter	56.4in	143.25 cm
Length ..	74in	188 cm
Weight ..	3,615 lb	1640 kg
Maximum power	2,705 h.p.	2742 c.v.





HERCULES 758

Diameter	52in	132 cm
Length ..	70.8in	180 cm
Weight ..	2,165 lb	982 kg
Maximum power	2,040 b.h.p.	2068 c.v.

BRITISH POWER UNITS 1953

Bristol Centaurus

LARGER relation of the Hercules, the 18-cylinder Centaurus, giving nearly 3,000 h.p., has many features in common with the 14-cylinder unit—in particular, sleeve valves. The current civil unit for the Elizabethans is the 661, with single-stage supercharger, torquemeter, synchronizing, and braking-airscrew equipment. The military counterpart is the 165, which has, in addition, provision for water/methanol injection at take-off. With these units accessory-drive power of 150 h.p. is allowed. Power plant refinements have been made, but no important changes have occurred in the engine since last year. Petal cowlings are provided with the latest piston power units.

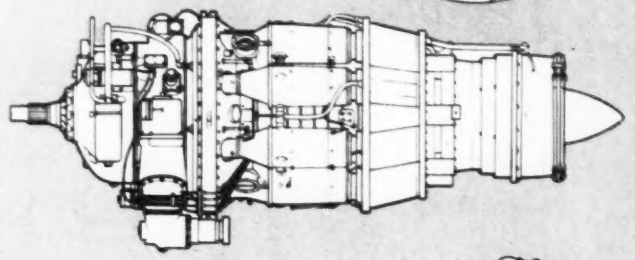
Bristol Hercules

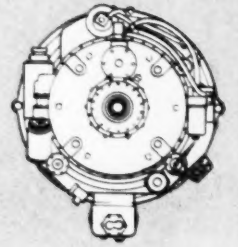
HERCULES two-row fourteen-cylinder radials continue to give excellent service in a variety of transport and other aircraft. These 2,000 h.p. Bristol units, more than any other, have laid the ghost of the unreliability of sleeve valves which plagued road-vehicle and aircraft-engine designers for so long; several marks of Hercules now enjoy a 1,200-hr overhaul period. The best-known Hercules types are the 634 as fitted to Viking aircraft; the 672, with free-exit cowling, for the Bristol Freighters; the 758, as licensed to France and used in a number of French aircraft; the similar military 230 for the Valetta; and the two-speed supercharged 760 Series (for the Hermes), of which the military counterpart is the 264 as found in the Varsity. Auxiliary drives on the 760s, for cabin supercharger, etc., can transmit 150 h.p. Small differences in series number are indicative of such things as alternative engine mountings, free-exit cowls, the provision of torquemeters and equipment for braking airscrews.

Bristol Proteus (and Coupled Proteus)

A TURBOPROP of great promise, the Proteus 700 Series now being produced for the Britannias shows improvement in several important respects over the earlier Proteus 600 or 2 (although four of these units are providing power for the prototype Britannia). The Proteus 1 and the Theseus together with the experimental Phoebus have all provided information and experience towards the present engines. Air enters the axial compressor at the rear, moves forward through it and then turns through 180 deg while passing through the centrifugal compressor. The two compressors, one axial of 12 stages and one of single-stage centrifugal type, supply 8 combustion chambers which in turn feed four turbine stages arranged in pairs. These front and rear two-stage turbines drive the compressors and airscrews respectively but are mechanically free of each other. Bristols feel that several advantages derive from this free-turbine arrangement, particularly freedom to vary airscrew speed over a wide range without affecting the efficiency of the engine, and, when starting, to provide power to accelerate only the compressor system. The Proteus 705s in production Britannias will later be superseded by the more powerful 750s. Both series have torquemeters and, incidentally, incorporate an airscrew-parking brake to prevent windmilling on the ground. Under operational conditions of 300 kt and 35,000ft specific consumption for the 750 is only 0.62 lb/s.h.p./hr or 0.495 lb/e.h.p./hr.

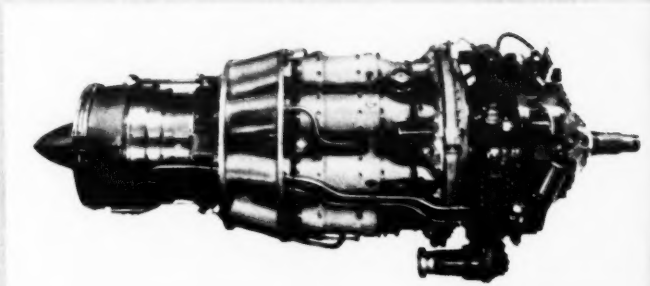
Coupled Proteus units for "buried" installations in the Princess flying-boats comprise two single units driving through parallel shafts a coupling gearbox. On this is mounted the common reduction gear and contra-rotating airscrew. Auxiliaries are carried on a remote gearbox.





PROTEUS 750

Diameter	39.5in	100 cm
Length ..	113in	287 cm
Weight ..	2,850 lb	1293 kg
Maximum power	3,650 s.h.p. + 1,320 lb	3700 c.v. + 598 kg



De Havilland Gyron

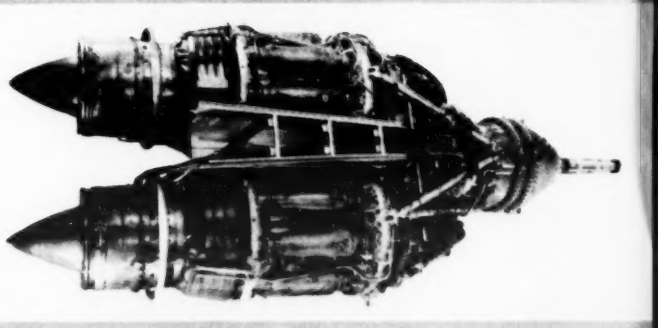
THAT the de Havilland Engine Company have privately ventured to design and build a new, very-high-powered turbojet recently became known, but it is too early yet for this important engine, now officially adopted, to be shown at Farnborough. Known as the Gyron H.4, it is of simple axial type and low weight, yet the thrust figure already attained is, according to foreign sources, no less than 16,000 lb. Development may take this up to 20,000 lb. First applications are to be for supersonic fighters. Major F. B. Halford is the chief designer.

De Havilland Ghost

TO the Ghost will always go the honour of being the first turbojet to go into civil airline service. It is fair to say that the Ghost 505s in the Comet 1s have lived up to, and in most respects surpassed, expectations. Engine failures have been practically unknown, and very rare unserviceability has in the main been caused by equipment. The overhaul period, now 600 hr, is shortly to be increased to 750 hr; most "consumable" parts are still serviceable at 1,000 hr. The Ghost closely resembles the smaller Goblin in conception, having the single moving assembly comprising centrifugal compressor, short shaft and single-stage turbine. In diameter it is only 3in more. The portly combustion chambers, however, number only ten, and they are fed through bifurcated ducts from the compressor. A compression ratio of 4.67 : 1 is unusually high for a single-sided centrifugal component. Military Ghosts can be equipped with reheat. The 50 Mk 2, as fitted in Comet 1As, has water injection and at 10,350 r.p.m. gives 5,125 lb thrust.

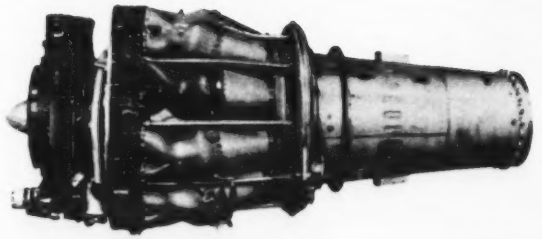
De Havilland Goblin

ONE of the first and most consistently successful of turbojets—the prototype ran in April 1942—the Goblin, power source for the Vampires, is familiar the world over. It was the first Allied turbojet to exceed 500 m.p.h. in level flight (April 1944) and it received the first military type-test clearance (February 1947). Of simple, robust design, it has a single-sided centrifugal compressor, 16 slim combustion chambers and a single-stage turbine—a reliable combination producing a familiar and characteristic scream when in operation. The latest Goblin, the 35, is likely to serve for many more years in the Vampire Trainer, in service with the R.A.F. The Goblin 35 differs in detail from earlier marks, having modified cascade vane-design and improved flame-tube and burner assembly to give better heat distribution. Later materials are used for turbine blades; there has been a slight reduction in the number of stator blades and a Lucas fuel system is now fitted. This unit gives 200 lb more thrust and has a slightly improved specific consumption. As experience is gained it is moving up the scale from a 300-hr overhaul period. The 600-hr period for the 3,300 lb thrust Goblin 2, approved in 1949, equals that of many well-established military piston engines.



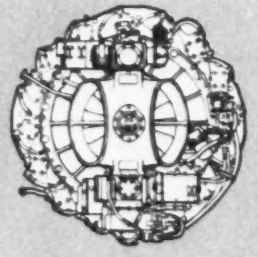
COUPLED PROTEUS

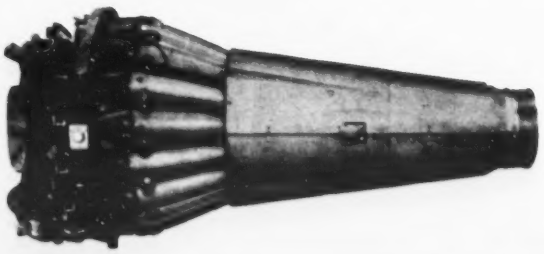
Width ..	80.4in	204 cm
Height ..	38.5in	97.7 cm
Length ..	167.3in	425 cm
Weight ..	7,180 lb	3256 kg
Maximum power	6,400 s.h.p. +1,600 lb	6489 c.v. +726 kg.

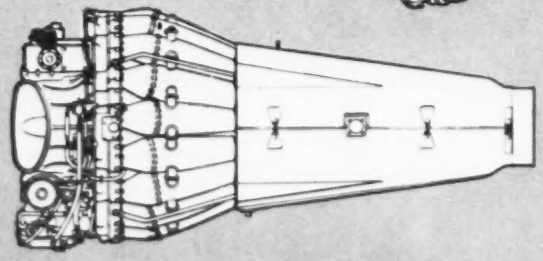


GOBLIN 35

Diameter	49.85in	126.6 cm
Length ..	100.5in	255.2 cm
Weight ..	1,629 lb	739 kg
Maximum thrust	3,500 lb	1587 kg

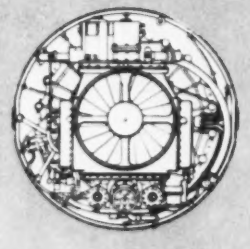


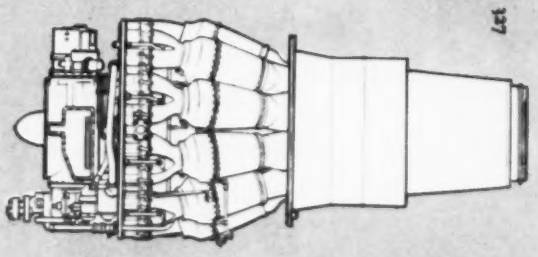


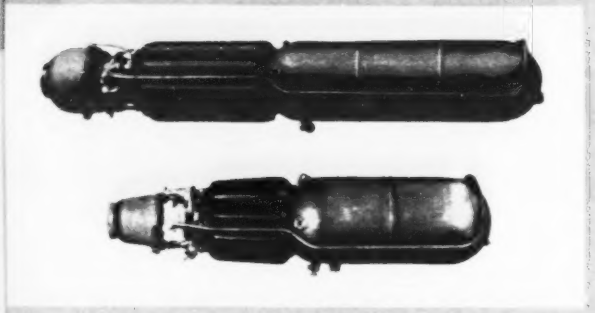


GHOST 50

Diameter	53in	134.6 cm
Length ..	121in	307.3 cm
Weight ..	2,218 lb	1006 kg
Maximum thrust	5,000 lb	2268 kg

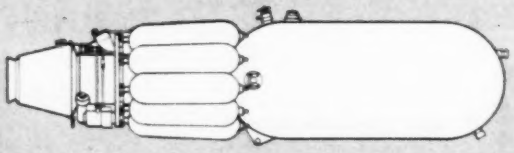


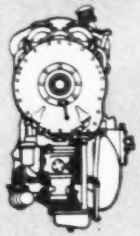


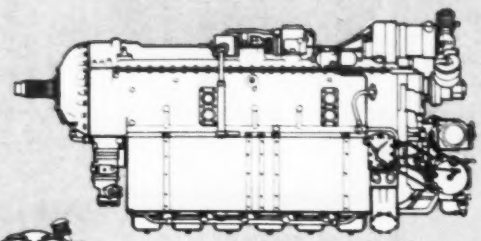


SUPER SPRITE		
Diameter	19.5in	49.5 cm
Length	117.5in	298.5 cm
Empty weight	600 lb	272 kg
Total impulse	120,000 lb-sec	54430 kg-sec
Maximum thrust	4,000 lb	1814 kg

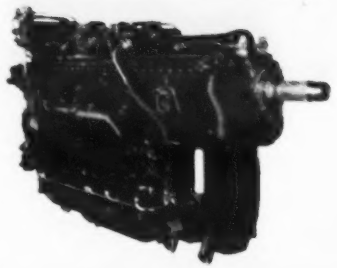
SPRITE		
Diameter	19.5in	49.5 cm
Length	84in	213.3 cm
Charged weight	925 lb	419.5 kg
Empty weight	350 lb	158.7 kg
Total impulse	55,000 lb-sec	24948 kg-sec
Maximum thrust	5,000 lb	2268 kg







GIPSY QUEEN 70			
Width	..	18.7in	47.5 cm
Height	..	33in	83.8 cm
Length	..	70.8in	179.8 cm
Weight	..	660 lb	300 kg
Maximum power	..	345 h.p.	350 c.v.



GIPSY QUEEN 30			
Width	..	19.59in	49.75 cm
Height	..	32.99in	83.8 cm
Length	..	61.5in	156.2 cm
Weight	..	525 lb	237.5 kg
Maximum power	..	250 h.p.	253 c.v.

BRITISH POWER UNITS 1953

De Havilland Sprite and Super Sprite

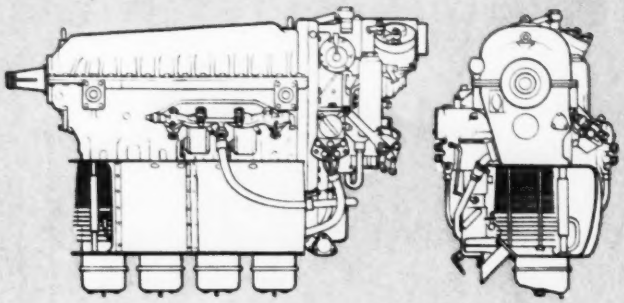
FROM appearances, Sprite and Super Sprite rocket motors have much in common, but whereas the first Sprite is a "cold" rocket operating on concentrated hydrogen peroxide with liquid permanganate catalyst, the Super Sprite, for military use, is a "hot" rocket with peroxide as oxidant, a solid catalyst of undisclosed composition, and kerosine or petrol (from the aircraft tanks) as fuel. The former rocket depends for its thrust on the steam and oxygen released by the chemical reaction; the newer type also employs this but in addition procures increased energy from the burning of fuel in the freed oxygen. The Super Sprite has a colourless exhaust. Both are described as rocket motors to assist take-off; they are light and relatively simple. The company's future plans and other rocket work may not be disclosed.

De Havilland Gipsy Queen

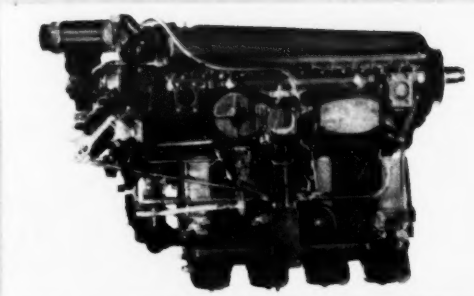
EVOLVED from the Gipsy Sixes of the Rapide and other early machines, the Queens are basically similar in being six-cylinder inverted in-line engines. Except for special racing engines such as the pre-war Six R, the 200 h.p. Queen 2s were the first to carry v.p. airscrews. A complete redesign after the war was followed by the announcement of the Queen 30 of just over 10 litres capacity and giving 230 h.p. (the earlier units were a litre smaller), and by the 345 h.p. geared and supercharged version the Queen 70. The latest Queens, the 70-4 and 70 Mk 2, and the 30 Mk 2, will each be seen at Farnborough—the first-named in the Dove, the second stripped after 1,000 hours running and the third in the Heron 2. Both have 6.5 to 1 compression ratio. The Heron's Queens have a special single-lever power and pitch control. The unsupercharged Queen 30 in particular has continued the good name for service and reliability of the older Gipsy Sixes. The Queen 70 Mk 2 develops 365-380 h.p. for take-off.

De Havilland Gipsy Major

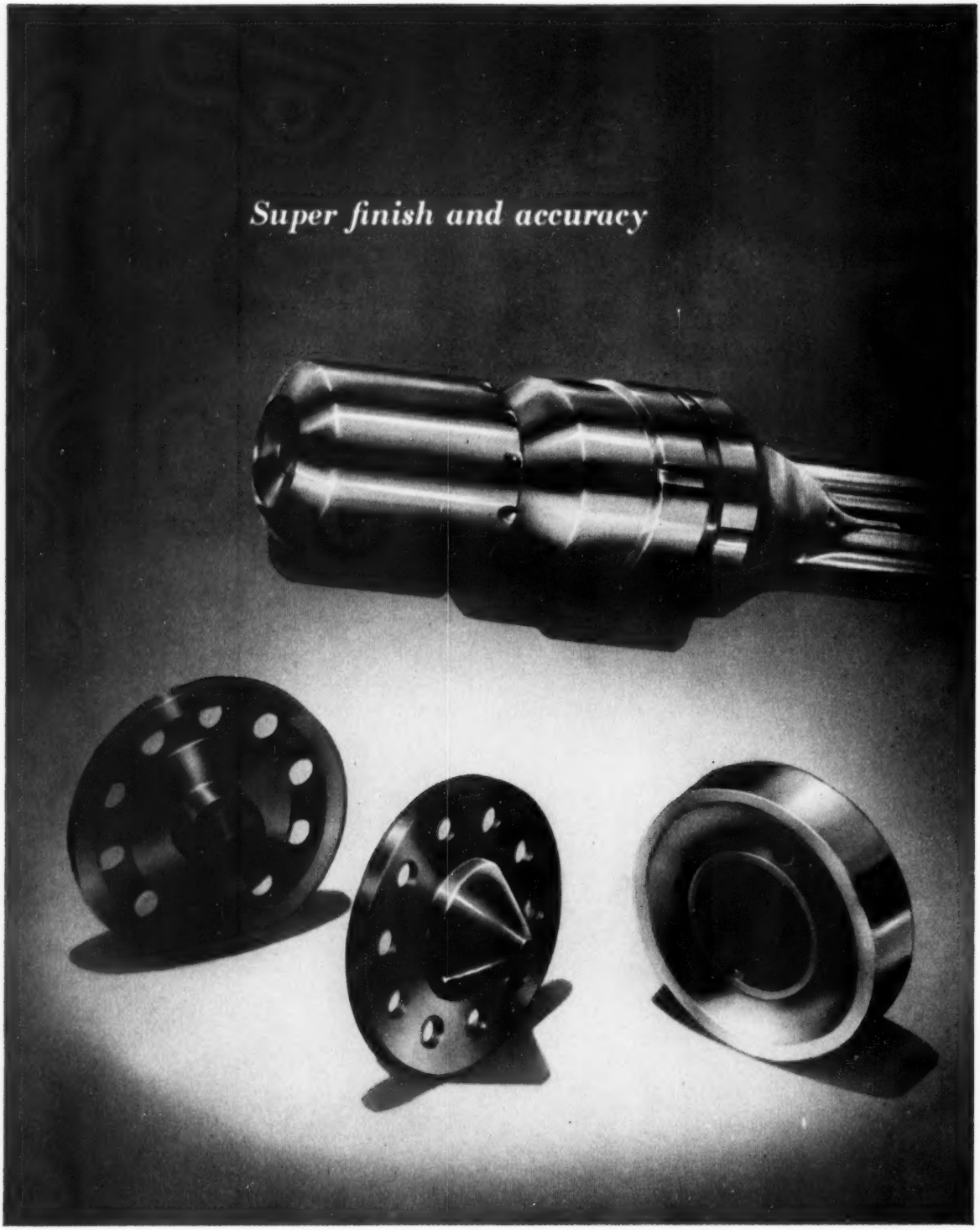
CURRENT Gipsy Majors, of which the 10 Mk 2 is the latest, head a line now in its thirtieth year. All have been built with long life and the minimum of attention in mind. The Major 1 leads all other engines with its overhaul life of 1,500 hr. The Major 10 Mk 2, of 6.124 litres capacity, is an inverted four-in-line type with modern arrangement of accessories. A fully screened ignition system is fitted and 12 mm sparking plugs are used. Provision is made for a manual v.p. airscrew. The 10 Mk 2 differs from the 10 in having crankshaft bearing and thrust-race improvements and in having a No. 1 S.B.A.C. parallel-spline airscrew shaft in place of a taper shaft. Cruising fuel consumption is between 8 and 9 gal/hr. Electric or cartridge starting may be employed.



GIPSY MAJOR 10		
Width ..	20in	50.8 cm
Height	30.5in	77.4 cm
Length	45.4in	115.3 cm
Weight	325 lb	146.4 kg
Maximum power	145 h.p.	147 c.v.



Sperry weather
YOUNG



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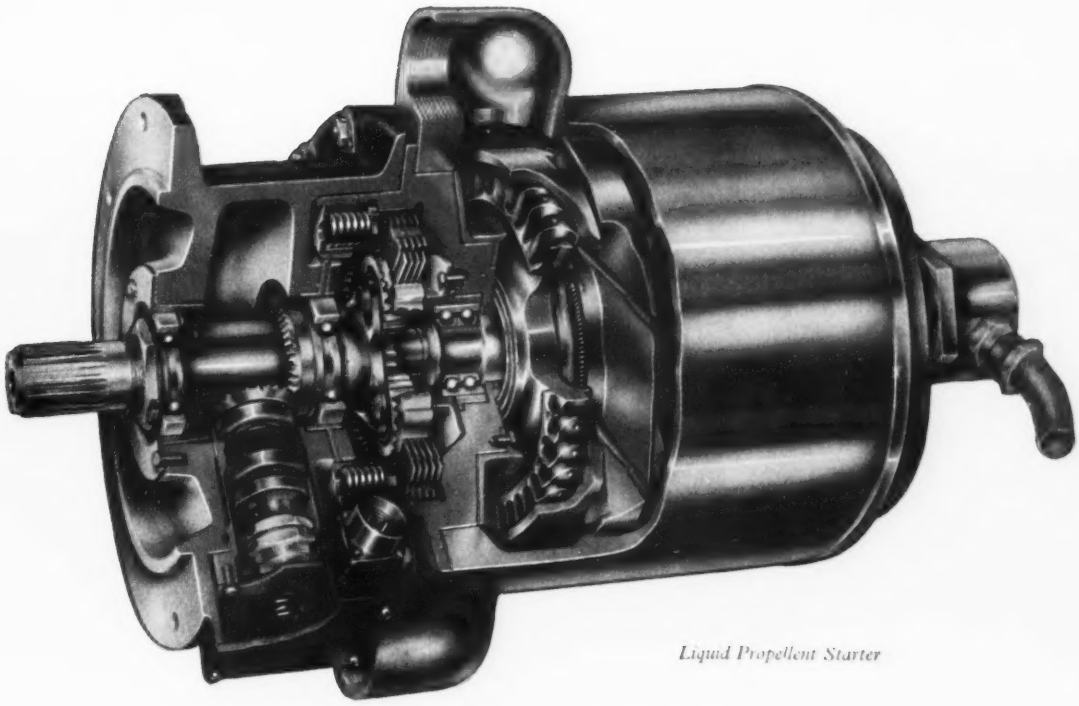

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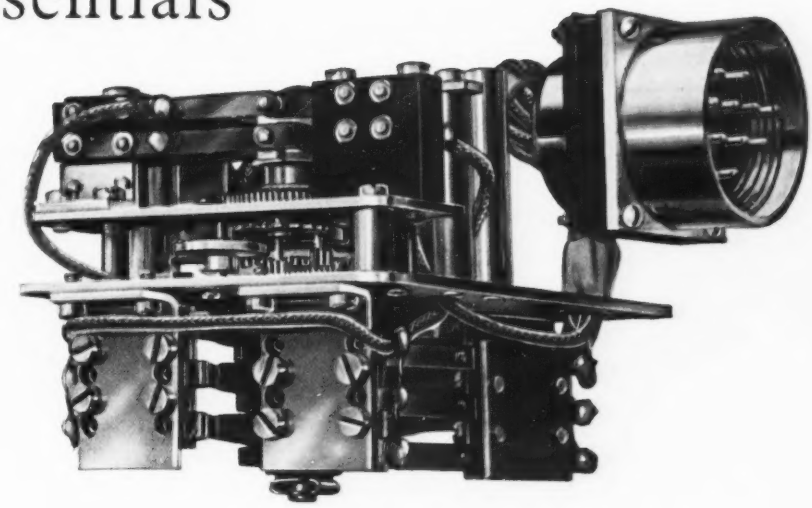

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Many more Westland S.51 and S.55 Helicopters are now in service than the combined deliveries of all other European rotary wing aircraft manufacturers put together.

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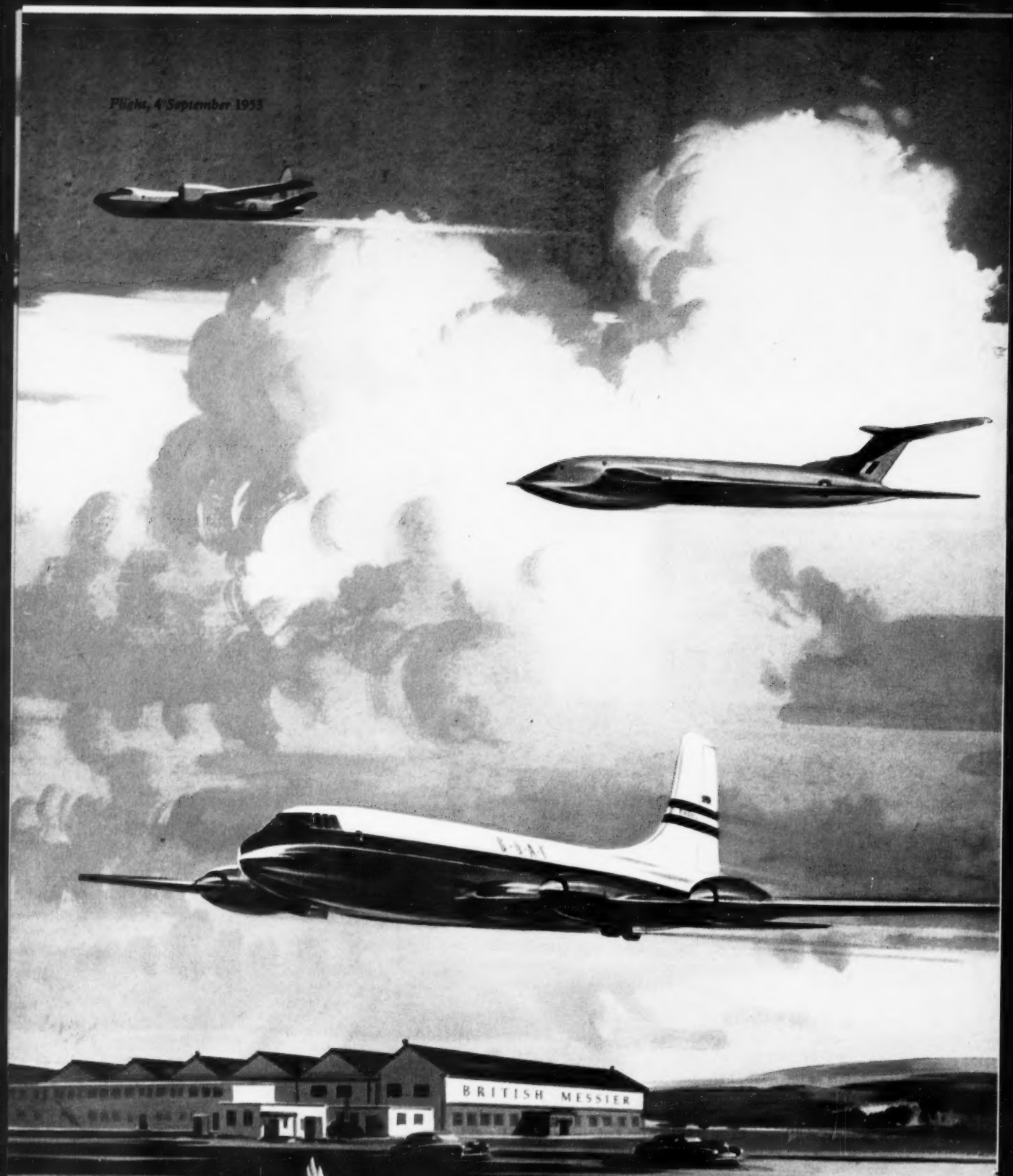

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BRITISH POWER UNITS 1953

Napier Eland

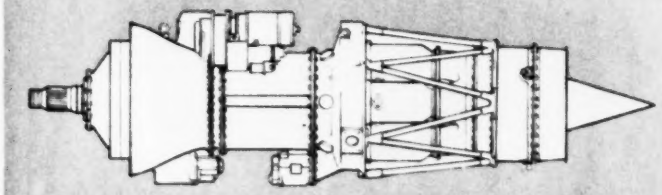
NEWEST arrival in the medium-power turboprop class, the Napier Eland nevertheless has considerable background in design experience. It is an axial unit of very small dimensions and very low weight (approx. ½ lb. per h.p.) for its 3,000 s.h.p. output. It is designed to drive a single c.s. airscrew. The specific consumption in particular is attractive to aircraft designers, a figure of 0.49 at 350 m.p.h. T.A.S. and 30,000ft being quoted. It has six combustion chambers, while recently released is the information that a ten-stage compressor and three-stage turbine are employed. A test-bed installation of two Elands in a Varsity is in hand. Elands with additional air compressors are named to provide the power for the recently ordered Rotodyne helicopter.

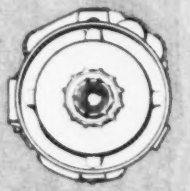
Napier Nomad

MORE light has recently been cast on Napier's Nomad developments. The moderate performance of early experimental units has been far surpassed, and although much work remains to be done, the truly remarkable specific consumption of around 0.33 lb/e.h.p./hr over a range of operational conditions sets it in a class apart—even from the American piston engines ingeniously adapted to recuperate exhaust energy. The Nomad NNm.6, designed from the start as a compounded unit, offers unique advantages for long-range aircraft and may prove to be one of the outstanding post-war developments in power units. Comprising a 12-cylinder, supercharged opposed-piston diesel engine, serving as both primary power source and gas producer for the exhaust turbine, the Nomad has an unusual form of gear-box for the coupling of turbine-shaft power *via* a quill shaft to that from the main crankshaft. The main reduction gear carries the combined power to the single airscrew.

Rolls-Royce Avon

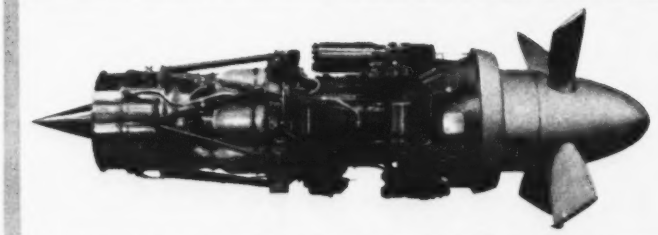
SINCE the 1952 S.B.A.C. Exhibition security has been slightly relaxed on the Avon family, which are without doubt among the few oustanding turbojets of the world. The recent performances of certain aircraft with Avon power have clearly indicated the development of more than the officially announced figure of 6,500 lb thrust, and now the RA.7, RA.7R and RA.14 can be mentioned together with their thrust figures of 7,500 lb, 9,500 lb with reheat, and 9,500 lb basic respectively. The latter unit has a specific consumption of 0.84 and the RA.7 of 0.92. These remarkable type-tested thrust figures are achieved from units of very modest weight and dimensions and with life and reliability of such an order as already to be acceptable by commercial standards. The RA.3 of 6,500 lb thrust as fitted to the B.O.A.C. Comet Series 2 is already approved for 600 hr between overhauls. This unit weighs 2,440 lb and has a specific consumption of 0.90. Avons up to and including the RA.7 have eight large combustion chambers.

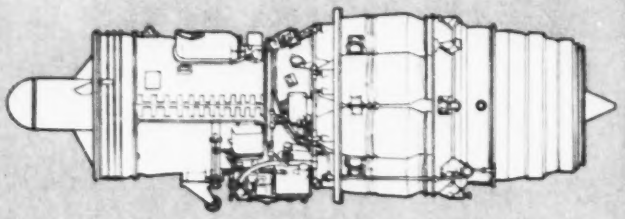




ELAND

Diameter	36.05in	91.5 cm
Length	104.5in	265.5 cm
Weight	1,575 lb	714.5 kg
Maximum power	3,000 e.s.h.p.	3042 c.v. p.t.e.

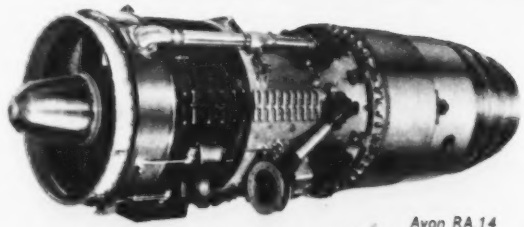




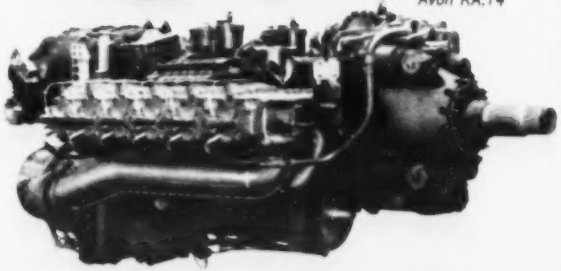
Avon RA.7

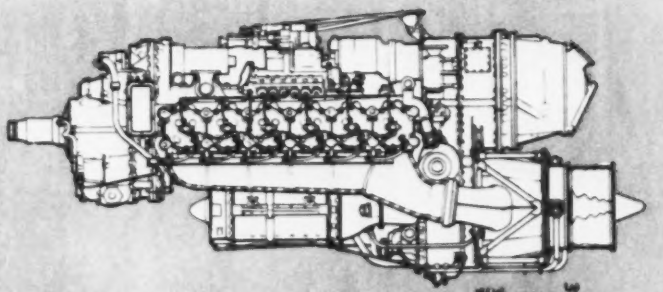
AVON RA.14

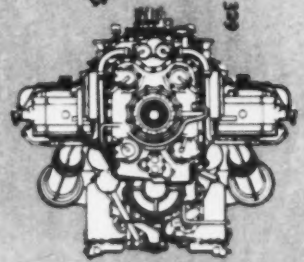
Length (with exhaust cone)	113.5in	287 cm
Diameter	41.5in	105.5 cm
Weight	2,860 lb	1297 kg
Maximum thrust	9,500 lb	4309 kg



Avon RA.14

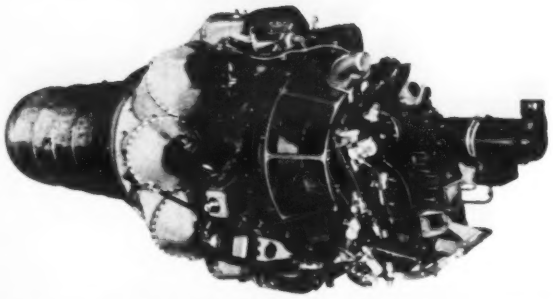






NOMAD 6

Width	58.25in	148 cm
Height	49.25in	125 cm
Length	119in	302 cm
Frontal area	19.25 sq ft	1.78 sq m
Weight	3,580 lb	1624 kg
Maximum power	3,135 e.s.h.p.	3179 c.v. p.t.e.

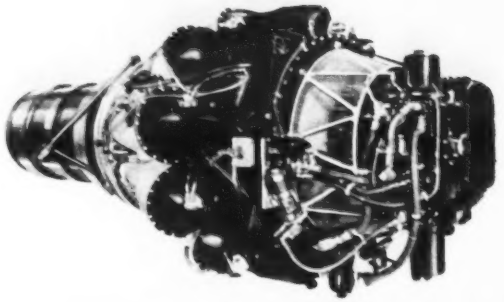


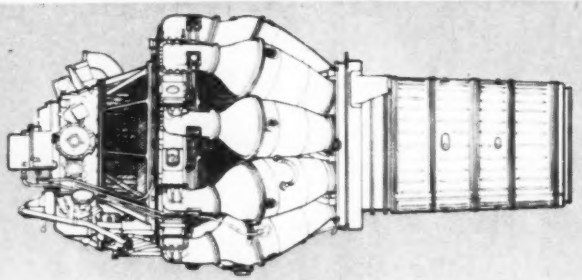
NENE

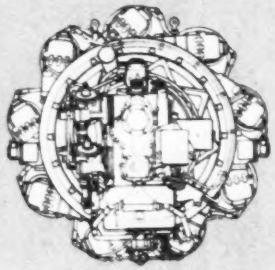
Diameter ..	49.5in	125.7 cm
Length ..	96.8in	245.8 cm
Weight ..	1,620 lb	734.7 kg
Maximum thrust ..	5,100 lb	2313 kg

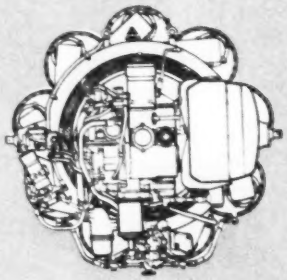
DERWENT

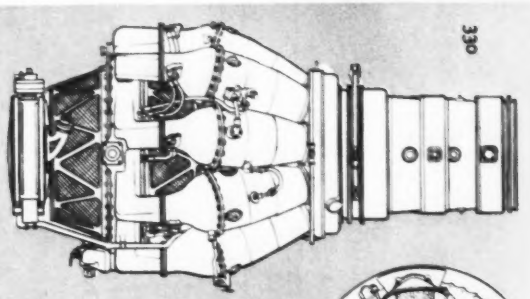
Diameter ..	43in	109.2 cm
Length ..	83.1in	210.8 cm
Weight ..	1,280 lb	580.5 kg
Maximum thrust ..	3,600 lb	1633 kg











BRITISH POWER UNITS 1953

Rolls-Royce Nene

ALTHOUGH for a long period the Nene did not find an application in any production aircraft, it proved invaluable in providing 5,000 lb thrust for a number of prototypes. It is of the older school of centrifugal compressor units, and the then high power output from a sturdy, reliable engine was especially welcome. Now the Navy have adopted the Nene in two of their latest jet fighters, the Attacker (Nene 3 or 102) and Sea Hawk (Nene 101, similar but with three-start turbo-starter, high-energy torch igniter and divided jet pipe). The Australians employ Nenes in their Vampires and the Canadians install them in T-33 trainers. Developments through the closely related Tay are seen in the Pratt and Whitney product built under licence and, along separate lines, in the Hispano-Suiza units in France. The Nene's two-sided compressor of 4:1 ratio supplies air to nine combustion chambers which in turn feed the single-stage turbine.

Rolls-Royce Derwent

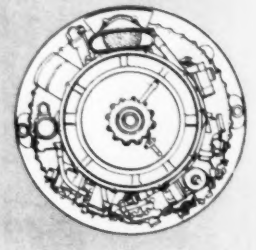
WIDELY used—especially in the Meteor family of aircraft—the Derwent, of which the Mk 8 is the current product, has over several years built up an enviable reputation for service all over the world. Of classical centrifugal-compressor (two-sided) and single-stage turbine type, the Derwent is simple by comparison with the latest axial designs. Its specific fuel consumption is 1.03 at sea level for maximum continuous thrust. Like the Nene it is the subject of a licence for building abroad. At 3,600 lb thrust it is running well within its capacity.

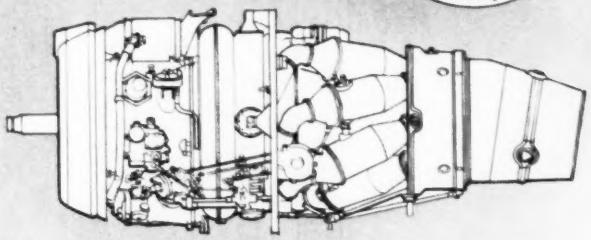
Rolls-Royce Dart

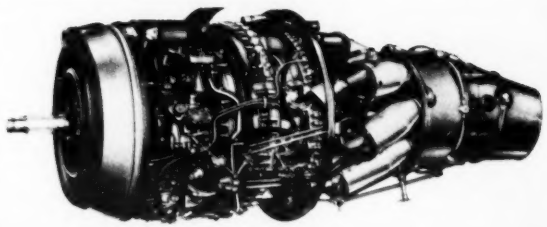
THIS now familiar turboprop is the subject of large orders for civil transports, and further development is in hand. It embodies the qualities—usually termed "ruggedness"—which are associated with centrifugal compression, yet enjoys a relatively small diameter and low specific fuel consumption. It has seven combustion chambers and a two-stage turbine. The present two-stages of centrifugal compression could later become three as more power is called for. In the meantime the Mk 505 produces a maximum continuous S.L. power of 1,120 s.h.p. for the Viscount now in service with B.E.A. Water/methanol equipment permits standard take-off power to be maintained at altitude and in tropical conditions.

DART

Diameter	38in	96.5 cm
Length ..	95.125in	241.7 cm
Weight ..	1,030 lb	467 kg
Maximum power	1,400 s.h.p. + 365 lb	1420 e.v. + 165 kg







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Pilot's Trim Control Assembly 90° AS.870 or AS.1230	**Fuel or Oil Drain Valves AS.2560, 2″ bore. AS.2573, 1½″ bore Flush Drain Valves AS.6270 1½″ bore. AS.6295 2″ bore**
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BRITISH POWER UNITS 1953

Rolls-Royce Griffon

LAST of the very long and successful line of liquid-cooled piston engines of the 60-deg vee-twelve configuration, the Griffon is exclusively a military engine. Its capacity is 27 per cent greater than that of the Merlin. Shackletons, which require long-range performance at low altitude, employ Griffon 57 single-stage two-speed units equipped to drive contra-rotating airscrews. A similar engine, but with shaft for a single airscrew, as for the Firefly, is Mk 5,900. This drives through an 0.522:1 reduction gear. Its weight is 2,025 lb.

Rolls-Royce Merlin

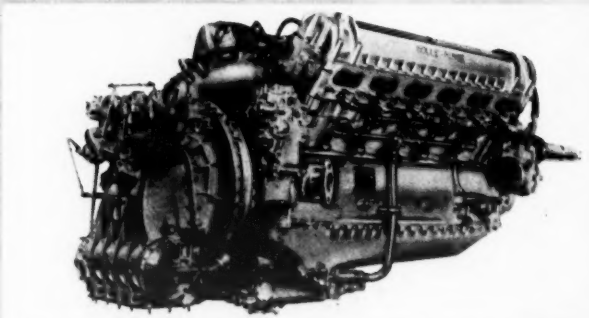
AFTER long and faithful service, the Merlin family has almost left Fighter, Bomber and Transport Commands of the R.A.F. Only a few Lincolns and Mosquitoes remain. The Navy, too, has almost finished with its Merlins. There are two types of Merlin which may be described as current, though no longer in production—the 724 civil power plant for B.O.A.C. Argonauts, and the 35 for Balliol trainers. This last-named unit has "shunt" cooling and is supplied with header tank for installation by the aircraft manufacturer. Memories may be refreshed with the information that the 12-cylinder vee liquid-cooled Merlins are of 27 litres capacity. The 35 has a 6:1 compression ratio, and its supercharger is of single-stage, single-speed centrifugal design. Fuel consumption is of the order of 68 gal/hr.

Rolls-Royce Conway

EXCEPT for the officially released statement that the Conway RCo.2 is a by-pass jet engine, nothing has been said about this new power unit. Some idea of its power and size can be gained from the fact that it has been specified for the Vickers 1000 (and V.C.7) jet transport, which has wings and power requirements similar to those of the Valiant. A characteristic of the by-pass engine is low fuel consumption. Part of the airflow from its compressor system is led round the combustion zone and turbine to rejoin the jet and lower its temperature and velocity, so giving higher propulsive efficiency.

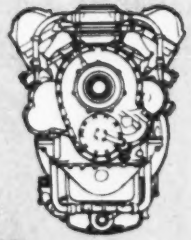
Avro Canada Orenda

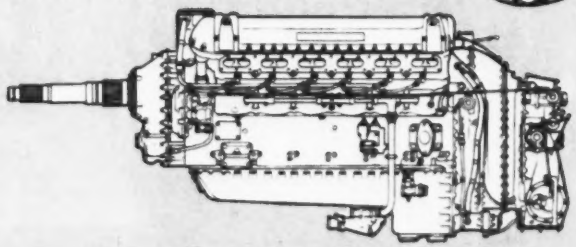
GREAT credit is due to the Canadian company who, with comparatively short experience of aircraft-engine design—though aided by some imported talent from America and England—have produced the Orenda turbojet to power their CF-100 fighter. Basically a 6,500 lb thrust unit, development has resulted in an increase of some 500 lb. With Solar afterburner over 9,000 lb thrust can be produced. It has a 10-stage axial compressor (several stages having steel blades), six combustion chambers and a single-stage turbine. The Orenda was preceded by the Chinook. Unofficial mention has been made of a new project, the Waconda, in the 10,000lb-thrust class, but no indication has been given as to progress with it.

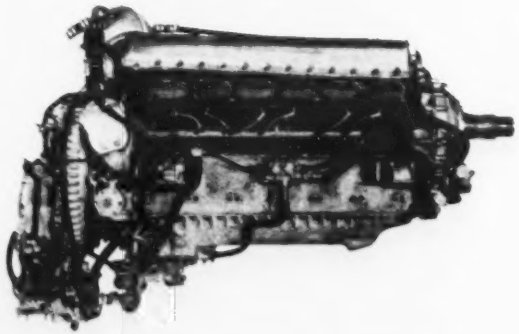


GRIFFON 57

Width ..	32in	81.28 cm
Height ..	41.5in	105.4 cm
Length ..	105in	266.7 cm
Weight ..	2,050 lb	930 kg
Maximum power ..	2,455 h.p.	2489 c.v.

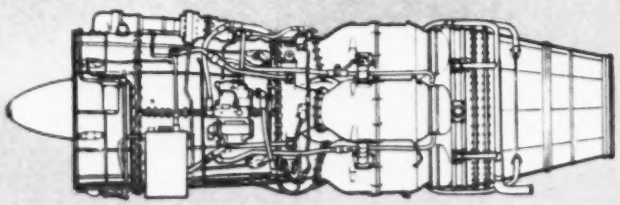






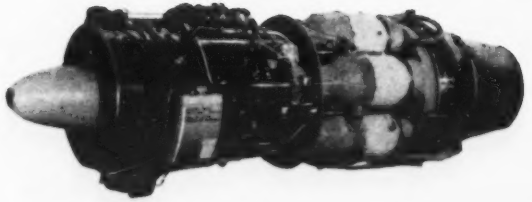
MERLIN 35

Width ..	29.82in	75.7 cm
Height ..	43.17in	109.6 cm
Length ..	67in	170 cm
Weight ..	1,520 lb	689 kg
Maximum power ..	1,280 h.p.	1297 c.v.



ORENDA

Diameter ..	42in	106.6 cm
Length ..	121.3in	308.1 cm
Weight ..	2,650 lb	1202 kg
Maximum thrust ..	7,000 lb	3175 kg



BRITISH POWER UNITS 1953

TURBOJETS, TURBOPROPS, COMPOUNDED UNITS, AND ROCKETS

Maker's name and engine type	No. of compressor stages	No. of combustion chambers	No. of turbine stages	Max. Static Power: Power: lb thrust	Max. Static Power: Power: s.h.p.	Max. Static Power: Speed: r.p.m.	Max. Static Power: s.f.c. lb/lb/hr or lb/eshp/hr	Total power lb thrust or equivalent s.h.p.	Representative Cruising Power: Power: lb thrust	Representative Cruising Power: Power: s.h.p	Representative Cruising Power: Speed: r.p.m.	Representative Cruising Power: Height: ft	Representative Cruising Power: Speed: knots	Representative Cruising Power: s.f.c. lb lb/hr or lb/eshp/hr	Power/Weight-ratio Note(1)	Power per sq ft frontal area Note(1)
ARMSTRONG SIDDELEY:																
Mamba ASM3	10	6	2	405	1,320	15,000	0.735	1,475	95	740	14,500	20,000	304	0.67	1.89	321
Double Mamba ASMD1	10[2]	6[2]	2[2]	810	2,640	15,000	0.735	2,950	190	1,480	14,250	20,000	304	0.67	1.41	246
Python ASP3	14	11	2	1,180	3,670	8,000	0.805	4,120	270	2,150	7,800	20,000	260.5	0.715	1.20	260
Sapphire ASSa6	n.r.	Ann.	n.r.	8,000	—	8,600	0.90	—	n.r.	—	n.r.	n.r.	n.r.	0.85	3.14	1,160
Snarler ASSn1	—	1	—	2,000	—	—	20.0	—	n.r.	—	n.r.	n.r.	n.r.	n.r.	9.01	—
Viper ASV3	7	Ann.	1	1,640	—	13,400	1.09	—	1,330	—	12,500	S.L.	Static	1.1	4.5	558
BLACKBURN TURBOMECA:																
Marbore II	1	Ann.	1	883	—	n.r.	1.15	—	330	—	n.r.	25,000	304	1.28	2.86	326
Palas	1	Ann.	1	353	—	n.r.	1.17	—	133	—	n.r.	19,680	347.4	1.40	2 2	250
BRISTOL:																
Olympus BOl 1	n.r.*	n.r.	n.r.	9,750	—	n.r.	0.766	—	n.r.	—	n.r.	n.r.	n.r.	n.r.	2.77	1,140
Proteus 755	12 + 1	8	4	1,320	3,650	11,000	0.67	4,150	300	1,360	—	35,000	300	0.495	1.46	484
DE HAVILLAND:																
Ghost 50 Mk 2	1	10	1	5,050	—	10,000	1.15	—	3,230	—	9,000	S.L.	Static	1.04	2.29	321
Goblin 35	1	16	1	3,000	—	10,250	1.13-1.19	—	2,320	—	9,500	S.L.	Static	1.20	1.84	218
Gyron	n.r.	n.r.	n.r.	n.r.	—	n.r.	n.r.	15,000 lb class	n.r.	—	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Sprite	—	1	—	5,000	—	—	n.r.	55,000 lb-sec	—	—	—	—	—	—	5.41[3]	2,293
Super Sprite	—	1	—	4,000	—	—	n.r.	120,000 lb-sec	—	—	—	—	—	—	6.66[3]	1,835
NAPIER:																
Eland	10	6	3	n.r.	n.r.	n.r.	0.624	3,000	n.r.	n.r.	n.r.	30,000	304	0.49	1.91	424
Nomad 6	12	12[1]	3	n.r.	n.r.	n.r.	0.35	3,135	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.	0.877	163
ROLLS-ROYCE:																
Avon Mk 502	n.r.	8	n.r.	6,500	—	n.r.	0.90	—	n.r.	—	n.r.	n.r.	n.r.	n.r.	2.67	666
Avon RA7	n.r.	8	n.r.	7,500	—	n.r.	0.92	—	n.r.	—	n.r.	n.r.	n.r.	n.r.	3.05	770
Avon RA14	n.r.	n.r.	n.r.	9,500	—	n.r.	0.84	—	n.r.	—	n.r.	n.r.	n.r.	n.r.	3.32	1,020
Conway	n.r.	n.r.	n.r.	n.r.	—	n.r.	n.r.	10,000 lb class	n.r.	—	n.r.	n.r.	n.r.	n.r.	n.r.	n.r.
Dart Mk 505	2	7	2	365	1,400	14,500	0.83	1,540	70	860	13,800	20,000	260.5	0.66	1.54	191
Derwent RD8	1	9	1	3,600	—	14,700	1.05	—	852	—	14,100	40,000	260.5	1.151	2.8	360
Nene RN3	1	9	1	5,100	—	12,500	1.06	—	1,707	—	11,800	30,000	347.4	1.215	3.15	378
AVRO CANADA:																
Orenda TR5	10	6	1	7,000	—	8,000	0.96	—	n.r.	—	n.r.	n.r.	n.r.	n.r.	2.64	730

Abbreviations: (*) *Two multi-stage, axial-flow compressors are used in series.* (1) *Piston-engine cylinders.* e.s.h.p., *equivalent shaft horse-power;* s.f.c., *specific fuel consumption;* n.r., *not released for publication.*

Notes: (1) *Power-weight ratio and power per sq ft frontal area is based upon lb thrust for turbojets and rockets and upon e.s.h.p. for airscrew-driving engines. Power is divided by weight.* (2) *Figures refer to each engine of a double unit.* (3) *Fuel weight included.*

REPRESENTATIVE PISTON ENGINES

Maker's name and engine type	No. of cylinders and arrangement	Cylinder bore and stroke in	Swept vol. litres	Take-off h.p.	Maximum Power: h.p.	Maximum Power: r.p.m.	Maximum Power: Boost lb/sq in	Maximum Power: Height ft	Cruising Power: h.p.	Cruising Power: r.p.m.	Cruising Power: Boost lb/sq in	Cruising Power: Height ft	Cruising Power: Fuel consumpt. gal/hr	Weight/power ratio lb/h.p. max.
ALVIS:														
Leonides 502/5	9R	4.8x4.41	11.78	560	570	3,000	8.0	1,750	455	2,900	3.5	7,250	23.0	1.37
Leonides 524/1	9R	4.8x4.41	11.78	545	565	3,200	7.0	4,000	410	2,800	2.0	9,000	24.0	1.12
Leonides Major	14R	4.8x4.41	18.28	870	870	3,000	8.0	S.L.	515	2,600	Zero	11,000	35.0	1.22
BLACKBURN CIRRUS:														
Bombardier	4 I.L.	4.8x5.5	6.524	180	180	2,600	—	S.L.	140	2,200	2.0	3,250	9.25	1.94
Major 3	4 I.L.	4.72x5.51	6.33	146	158	2,450	—	S.L.	135	2,190	1.5	1,500	9.20	2.23
Minor 2	4 I.L.	3.94x5.0	3.98	92	100	2,600	—	S.L.	78	2,200	2.0	3,000	5.50	2.40
BRISTOL:														
Centaurus 57	18 R2	5.75x7.0	53.60	2,810	2,820	2,700	11.5	500	1,745 1,600	2,400 2,400	2.5 2.5	11,000 21,250	107.5 105.6	1.00
Centaurus 661	18 R2	5.75x7.0	53.60	2,625	2,705	2,800	13.5	4,000	1,675 1,575	2,400 2,400	3.5 3.5	11,500 17,500	101.7 105.6	1.26
Hercules 758	14 R2	5.75x6.5	38.7	2,040	2,090	2,800	13.0	3,000	1,215	2,400	3.5	10,750	74.0	1.00
DE HAVILLAND:														
Gipsy Major 10/2	4 I.L.	4.65x5.5	6.124	145	145	2,550	—	S.L.	125	2,300	2.0	3,000	8.85/9.25	2.20
Gipsy Queen 30/2	6 I.L.	4.73x5.9	10.178	250	250	2,500	—	S.L.	217	2,500	2.0	2,900	12.5/13.1	2.10
Gipsy Queen 70/2	6 I.L.	4.73x5.9	10.178	380	390	3,000	7.5	4,750	265	2,400	2.0	8,000	16.8/17.5	1.90
ROLLS-ROYCE:														
Griffon 57	12 V	6.0x6.60	36.70	2,455	1,985 1,800	2,750 2,750	18.0 18.0	1,500 9,750	1,360 1,285	2,400 2,400	9.0 9.0	6,000 12,500	124	0.851
Merlin 35	12 V	5.4x6 0	27.00	1,280	1,245	3,000	9.0	11,500	755	2,100	4.0	6,750	68	1.19

R—Radial. R2—Row Radial. I.L.—Inverted in-line. V—60 deg Vee. S.L.—Sea level. In this table, weight is divided by power in the last column.

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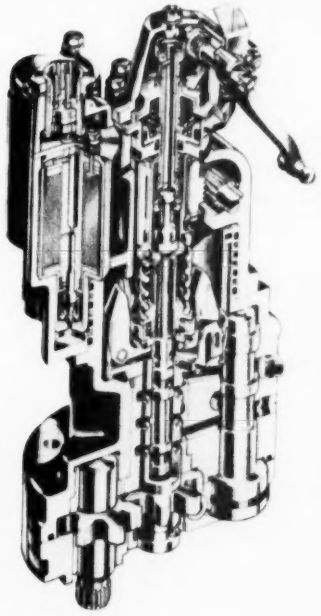
PROPRIETARY EQUIPMENT

New Major Aircraft Components Reviewed



Rotol controller for Viscount airscrew.

MANY firms in the British aircraft industry manufacture major items of aircraft equipment which, by virtue of their complex nature, warrant more detailed introduction than can be accorded them in the extensive directory which follows this section. Accordingly, these pages are devoted to brief descriptions of selected new or recent products of such firms, and serve well to indicate the great strength of the component-manufacturing industry without which no British aircraft could take the air.

In addition to these representative products there remain numerous items that manufacturers are unwilling to discuss in detail at this stage but which will be displayed at the forthcoming Show. These new products will be fully described and illustrated in our Farnborough-report issues.

Airscrews

The Airscrew Company and Jicwood, Ltd., Weybridge, Surrey (Stand 45), are this year celebrating their 30th anniversary. This thirty years' service will be the theme of their stand at Farnborough, and the principal exhibit will be a moving unit displaying a range of fan units and photographs of the aircraft in which they are fitted.

This company is concentrating on non-metal, fixed-pitch fans and airscrews, and their products include test fans and wind-tunnel fans. Among aircraft airscrews, that produced for the M.L. pilotless target is typical; driven by a two-stroke piston engine of 65 h.p., this unit is made from laminated wood, with a plastic leading-edge sheath. The diameter is 4ft 6in.

De Havilland Propellers, Ltd., Hatfield, Herts (Stand H). These manufacturers employ both the forged light-alloy and hollow steel methods of construction, examples of which continue to be designed for all types of piston and turbine power plant.

Examples in the former field are the four-blade unit developed for turboprops of some 1,500-2,000 h.p. and a 10ft diameter airscrew to be shown at Farnborough is suitable for the R.R. Dart. The company continue to develop forged hollow-steel units in large sizes for the most powerful types of aircraft; the four-blade airscrew for the Britannia has now been followed by a similar unit for the Beverley which is six inches less in diameter (at 15ft 6in) but employs the same mechanical principles of reversing, quick feathering and hydraulic pitch-locking.

Rotol, Ltd., Cheltenham Road, Gloucester (Stand 57). Viscount airscrews, of the composite-blade type, in which an electric de-icing element is housed inside the rebated leading edge of each blade beneath a sheath of beryllium-copper, are representative of latest Rotol practice. Complementary to this neat four-blade unit are the associated feathering pump and controller unit; both will be shown fully sectioned, as is the drawing of the latter unit on this page.

Completely new equipment will include the accessory drives of the Fairey Gannet and de Havilland Comet 2. For the four Avons of the latter aircraft, Rotol have developed a variation of their well-known synchronization equipment, which keeps the main rotating parts of all four engines turning at precisely the same speed. Another new product is a lightweight feathering - pump motor — designed and made by Rotol—which will be exhibited "exploded." A particular feature of this unit is the manner in which silicone compounds have been used to obtain optimum efficiency at high ratings and temperatures.

Cabin Air-conditioning

De Havilland Propellers, Ltd., Hatfield, Herts (Stand H), are licence-producing the Hamilton Standard cold-air unit for incorporation in all types of high-altitude cabin systems. Fed with compressor-bleed air at high temperature and pressure, this neat unit cools the flow by expansion across a turbine, the turbine being braked by a fan which draws a separate flow of cooling air through heat exchangers in the cabin-air circuit. The cold-air unit is robust and simple, and has a particularly noteworthy lubrication arrangement; a grease cartridge is used which heats up during running and exudes oil which flows to the bearings; when the unit cools after use the oil flow ceases.

Sir George Godfrey and Partners, Ltd., Hampton Road West, Hanworth, Middx. (Stand 93), have, since the last S.B.A.C. show, developed a number of additional air-conditioning units. The most important are probably the air-turbo drive sets and the TF series of cold-air units.

The latter are similar to the well-known BT (brake turbine) units, except that a turbo-fan (TF) is used to load the turbine, instead of a compressor. By utilizing a fan with about twice the capacity of the turbine sufficient cooling air can be drawn through a pre-cooler to ensure proper cabin cooling while the aircraft is on the ground. Two TF sets will be exhibited: the TF-5 and TF-10.

The other Godfrey development, the air-turbo drive, is discussed here for convenience, although it is not principally concerned with cabin air-conditioning.

The air-turbo drive, one of which is illustrated on page 336, will provide a simple method of driving aircraft auxiliaries which has much to commend it. A primary application for these units is the provision of a constant-speed drive for alternators, the lack of which has until now rather restricted the adoption of A.C. systems. To meet this demand, a Godfrey TG-3 air turbine has been matched to a Rotax six-pole, 15-kVA alternator delivering a three-phase supply controlled to 400 cyc/sec ± 2½ per cent. A later development is a set capable of providing the heavier loads that some aircraft require; unlike the former unit, it will not require a gearbox drive, and will be simpler and lighter. The same supply frequency will be used, but control to within ± 1 per cent will be possible.

Normalair, Ltd., Yeovil, Somerset (Stand 47), have designed a number of entirely new items of equipment. Of these, probably the most significant are the Type D pressure controller and the associated Type 30/SC discharge valve, both of which have been developed for the Comet 3.

The pressure controller, illustrated on this page, is purely pneumatic in operation, and thus is very much smaller and lighter than its electric or mechanical predecessors. Another obvious advantage is the reduced likelihood of failure in service. A desirable new feature is the manner in which the cabin-pressure "flight plan" can be preset before take-off.

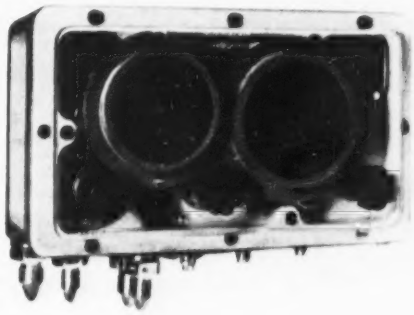
Unlike previous discharge valves, the 30/SC bellows houses a form of pressure-relay valve which ensures a precise response to the master controller. If a particular aircraft system calls for duplicated controller/discharge valves, a second discharge unit can be fitted in cascade with the 30/SC. This second unit, fitted with a simple integral control unit, can automatically take over in the event of failure of the master controller or its associated unit.

Engine and Fuel Accessories

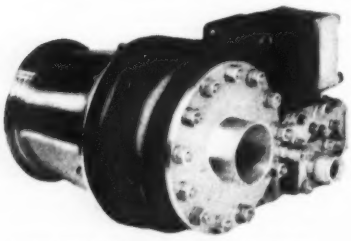
The British Thomson-Houston Co., Ltd., Rugby (Stand 101), make most of the cartridge starters currently in R.A.F. service (with the Canberras). All these units are capable of driving the engine well up beyond its sustaining speed, so ensuring a good acceleration to idling speed.

The starter is, in each case, a small impulse turbine driven by the exhaust from a combustion chamber in which is burnt such a fuel as cordite or guanidine nitrate —or other solid or liquid propellants. Depending on the power required and the torque-limit on the drive shaft, the burning time varies between 2 and 15 seconds.

Normalair Comet 3 pressure-controller.



K.L.G. thermocouple harness for Dart.



Lucas turbine-driven re-heat fuel pump.

PROPRIETARY EQUIPMENT

One of the latest patterns is the TBS 70 starter, which is a three-shot unit designed for starting large turbojets. It has been found possible to pack three cartridges into the "bullet" fairing at the front of an engine, so greatly increasing the flexibility and utility of the unit. The TBS 70 is used on the re-heat Avon RA.7R and also on the Nene of the Sea Hawk.

Delaney Gallay, Ltd., Vulcan Works, Edgware Road, London, N.W.2 (Stand 162), have already developed a most advanced oil cooler for a project which is still secret. This unit, which is made in light alloy, operates at high pressure and the cooling is effected by a flow of fuel from the main tanks of the vehicle.

Cross-flow heat exchangers continue to occupy much of the company's attention, and the two most recent publishable units—those for the Viscount and Britannia—are made entirely in stainless steel. The Britannia unit is now open for public display; it is used to provide hot air for wing de-icing.

Dowty Equipment, Ltd., Arle Court, Cheltenham, Glos. (Stand 205), now produce a considerable variety of fuel system components. Prominent are a range of high-performance pumps and the Spill-system with which they may be associated. The Spill fuel system is capable of giving excellent fuel atomization over the entire working range of the engine, since the air and fuel velocity for this purpose remains sensibly constant irrespective of the mass flow and power output.

A controlled spill of fuel is thrown back from the burner through an annular orifice at the rear of the swirl chamber. By so doing, a continuous high rate of fuel supply can be maintained to the burner of which a progressively reduced proportion is "spilled" as the engine power is increased.

Of the current Dowty pumps, the Type ENG.129, for the Sapphire (and, licence-produced by Thompson Products, for the Curtiss-Wright J65) is typical. This is a multi-plunger unit, and among its many good features may be listed: the use of fuel-pressure applied to the rotating parts to cancel out frictional loads and reduce wear, and the manner in which "Michell-block"-type slippers are used to impart the eccentric track-ring motion to the plungers without the need for lubrication. An even later pump, of yet greater capacity, is the Type ENG.300, which will be shown at Farnborough for the first time; Type ENG.129 delivers up to 1,575 gal/hr of kerosine at 1,000 lb/sq in. at 3,500 r.p.m.

Flight Refuelling, Ltd., Tarrant Rushton Airfield, Blandford, Dorset (Stand 7), have announced three entirely new items. Particularly attractive is the Mk.17 in-line refuelling valve, specially designed to meet the requirements of a line shut-off valve, and to obviate special tank bolt rings and inaccessible valves.

The valve—claimed to be the lightest in the world, at 28 oz—is electrically operated, consuming but 3.1 W. It operates on the pressure-differential principle, the valve being actuated by a solenoid and bellows. A typical application is in the refuelling line to a tip-tank, where a normal shut-off valve is impracticable. The Mk.17 can pass 50 gal/hr, with a pressure drop of 8 to 9 lb/sq in.

K.L.G. Sparking Plugs, Ltd., Putney Vale, London, S.W.15 (Stand 4), have, during the past year, finished development on such diverse products as: high-energy igniters for the high-flying Rolls-Royce Avon and Bristol Olympus; high-frequency igniters for the Plessey monofuel starter and the Napier Nomad compound engine; sparking plugs for the Vincent Picador, D.H. Gipsy Major and Alvis Leonides; and jet-pipe thermocouples for the Fairey Gannet and Vickers Viscount.

The last-named unit, developed in conjunction with Rolls-Royce, uses six thermocouples (chromel/alumel) insulated with K.L.G.'s new "Bluestone," which has great resistance to thermal shock and mechanical impact. The head of each thermocouple is further sealed by a vitreous compound, and the leads are insulated by P.T.F.E. oversheathed with high-grade, stainless-steel flexible conduit. The unit is illustrated on this page.

Joseph Lucas (Gas Turbine Equipment), Ltd., Willesden Junction, N.W.10 (Stand 157), make fuel systems for all types of turbine-driven aircraft, and a great many new components will be on view at Farnborough.

All these units reflect the necessity to develop governors and control devices which function accurately irrespective of fuel density; wide-cut gasoline is the fluid most commonly dealt with. One such unit is a constant-pressure gear pump, with a mechanical governor for use with spill-flow systems. Another is a simplified combined control unit for expendable turbojets which includes an altitude control, a spill-flow valve to control pump delivery, a proportional-flow throttle and a shut-off cock.

Among straightforward fuel pumps, the D-size is of impressive performance. This is a variable-stroke, multi-plunger unit, the capacity being adjusted by a servo control. Delivery at 3,500 r.p.m. is no less than 1,680 gal/hr at 2,000 lb/sq in. Another novel and compact exhibit will be a re-heat pump, designed to pump fuel to the afterburner of a powerful turbojet. The small centrifugal impeller is driven from a single-stage turbine fed with hot, compressed air tapped from the main-engine compressor delivery. Illustrated on this page, this tiny unit can deliver over 2,000 gal/hr at pressures in excess of 600 lb/sq in—a remarkable performance for a small, centrifugal single-stage pump.

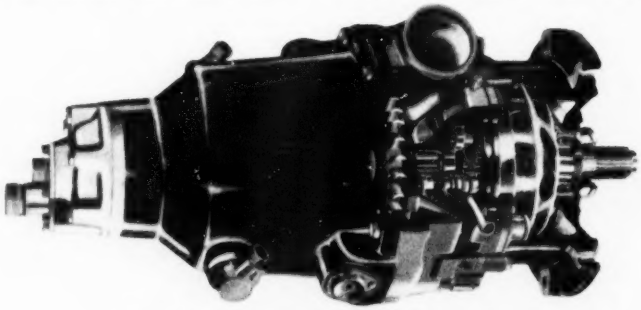
The Plessey Co., Ltd., Ilford, Essex (Stand 15), and Plessey International, Ltd. (Stand 14), are large-scale manufacturers in the fields of radio, electric power, electronic, hydraulic, engine-starting, and press-tool work. A most important item is the liquid-fuel starter for large gas-turbines, in which sphere Plessey were pioneers; they can at present claim to have the only such unit to have passed an M.o.S bench test.

The fuel used is iso-propyl nitrate, which is decomposed under heat and pressure without the use of any oxidant or catalyst. The resulting exhaust is led to a single-stage turbine, at a temperature no greater than 600 deg C. In use the whole arrangement has proved very successful; the fuel is readily available, safe, stores well, and is quite cheap, the power output (the present standard types are of some 70 and 150 h.p.) can be varied by altering the fuel throughput, and the installed starting system shows many other advantages in flexibility and lightness compared with other systems.

Next week, Plessey will show the latest, more compact version of the unit, and it should be noted that a licence is held for its production in America by the Hamilton Standard division of United Aircraft. After some three years' development in the Plessey Starter and Monofuel laboratories the first liquid-fuel units are now going into production. The actual model exhibited is the LTSA 70, of about 70 b.h.p., which has been successfully put through M.o.S. type-tests. It is shown below.

Rotol, Ltd., Cheltenham Road, Gloucester (Stand 57). It is clear that, if disproportionate consumption occurs between fuel tanks disposed over the wings and fuselage of any aircraft, there will be a corresponding loss in stability. This can be serious in high-speed aircraft—in which, in any case, rate of fuel consumption is high—and Rotol have developed a fuel-flow proportioner to obviate this trouble.

Fuel from each tank is led to a metering unit consisting of an eccentric-vane pump, the volumetric displacement of which is proportional to the capacity of



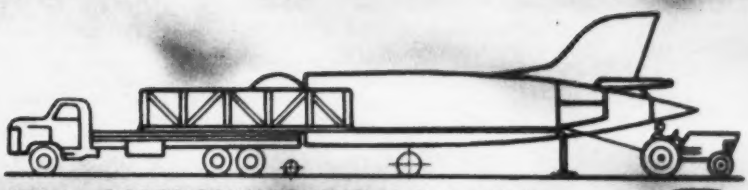
Plessey LTSA 70 liquid-fuel starter for fighter turbojets.

AN INTRODUCTION TO THE *Accountant*

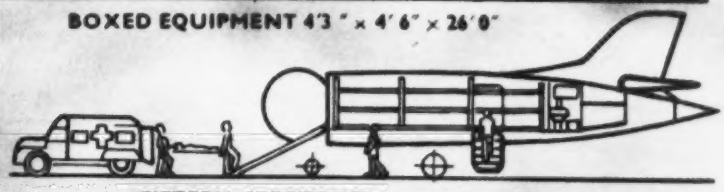
PROVISIONAL INFORMATION

(21,000 lb A.U.W.—disposable 9,000 lb)

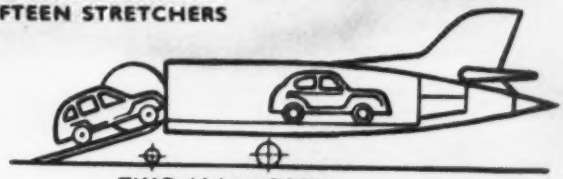
Seating Capacity	22 normal 33 maximum		
Length	55' 6"	Span	64' 0"
Height	20' 0"	Cabin Length	28' 6"
Cabin height	6' 3"	Cabin width	7' 5"
Cabin and Toilet volume	1,250 cub. ft.		
Normal stage length (full reserves)	920 S. miles		
Take off to 50 ft (I.S.A.)	21,000 lb—2,040 feet		
Rate of climb S.L. max. continuous—2,500 ft/min.			
Rate of climb 30,000 ft max. continuous—500 ft/min.			
Time to 30,000 ft	24 minutes		
Distance to 30,000 ft	86 S. miles		
Fuel used to 30,000 ft	60 Imp. galls.		
Max. cont. speed at 25,000 ft	316 m.p.h. T.A.S.		
Stalling speed Flaps T.O. 21,000 lb	88 m.p.h. E.A.S.		
Stalling speed Flaps Landing 21,000 lb	77 m.p.h. E.A.S.		
S.B.A.C. (2,000 hrs) min. cost seat/S. mile	1·0 pence		
S.B.A.C. (2,000 hrs) min. cost aircraft/S. mile	21·0 pence		



BOXED EQUIPMENT 4'3" × 4'6" × 26'0"



FIFTEEN STRETCHERS



TWO 14 h.p. CARS

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PROPRIETARY EQUIPMENT

its associated tank. Since the rotational speed of each vane assembly is the same as that of its neighbours, it follows that each metering unit will deliver fuel at the correct rate to ensure that proper balance and tank-state relationship is maintained in all conditions of flight.

Teddington Controls, Ltd., Cefn Coed, Merthyr Tydfil, South Wales (Stand 63), are responsible for a very wide range of air and electric devices for controlling all types of aircraft auxiliary systems. In the field of engine accessories, the company will show, at Farnborough, de-icing valves and controls, starting-cycle time switches and the latest patterns of fuel-tank pressurization.

In the latter connection, the air/gas valve illustrated on this page is of interest. Styled Type FLA, it is designed to pass large flows at low pressure-drops; it is suitable for air inlet pressures up to 180 lb/sq in, and nitrogen pressures of 1,800 lb/sq in.

Waymouth Gauges and Instruments, Ltd., Station Road, Godalming, Surrey (Stand 1), will exhibit for the first time, indicators, tank units, and power unit of the Smiths-Liquidometer fuel gauge. This system utilizes a special, self-balancing capacitance bridge circuit, which includes a reference capacitor; the latter is immersed in the fuel to cancel out differences in dielectric constant when varying types of fuel are to be measured. The system can be arranged to give individual or summated contents indication in terms of either fuel volume or weight.

Waymouth will also show a gas-turbine temperature-control amplifier. Fed with signals from thermocouples mounted just downstream of the turbine, the amplifier controls an electro-magnetic valve which, in turn, actuates an hydraulic servo connected to the engine fuel control unit.

Landing Gear

British Messier, Ltd., Gloucester (Stand 56), are producing new main and nose undercarriage units, and a variety of brakes to be shown publicly for the first time next week. A typical example of Messier work is the big bogie undercarriage of the Britannia; a more recent design is that shown on page 337. Although no details of the latter are forthcoming, it can be seen that it is for a swept-wing aircraft. The tyre is Dunlop size 33 x 6.75-20—which, from the catalogue of that company, is found to be one of the most advanced units yet developed, with the extraordinary performance of: maximum dynamic load, 39,220 lb, at 280 lb/sq in inflation pressure. It will be interesting to see what aircraft this landing gear is fitted to.

In the realm of brake development, Messier continue their work with various types of disc and plate units, and their associated pumps. Another line of development concerns brakes for helicopter rotors; the type on view will be that produced for the Sycamore, which is an hydraulically actuated unit weighing less than corresponding mechanical brakes.

Dowty Equipment, Ltd., Arle Court, Cheltenham, Glos. (Stand 205), are the patentees of the Liquid Spring method of shock absorbing. They have developed numerous undercarriages utilizing this principle, and the latest example to go into quantity production is that for the Hawker Hunter. No performance details may yet be given, but it can be said that the main-leg shock-absorber efficiency is over 90%.

A feature of this landing gear is the manner in which the operating cylinders of the Dunlop plate brake have been attached directly to the leg, instead of being fixed to the usual brake back-plate. Not only has this procedure effected a significant saving in weight, but the capacity of the brake has also been increased.

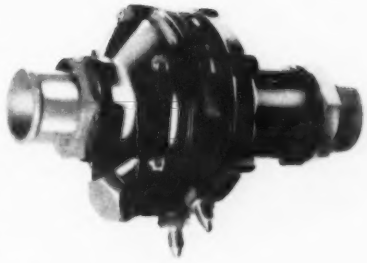
In a very much bigger scale, the undercarriage developed for the Avro Vulcan is an impresive example of Dowty engineering. Here, the main leg slides in a large light-alloy casting which contains no shock-absorber at all. In fact, only one shock strut is used, and this is mounted between the mid-point of the bogie beam and the rear of the main casting. The bogie beam carries four double-tyred wheels and is pivoted about the axle of the front pair; numerous advantages accrue from this geometry, including reduced wear on the front wheels and the unit's ability to fold neatly into the Vulcan wing.

Dunlop Rubber Co., Ltd., Aviation Division, Holbrook Lane, Foleshill, Coventry (Stand 154), now mould a new dimpled tyre, which has gone into service with the B.O.A.C. Comet Fleet during the past year. The original Comet tyre was ribbed, and the circumferential serrations could pick up stones, and other matter, and cause damage both to the tyres themselves and to the airframe. The new pattern has a smooth tread and is also strengthened to allow greater sideways loads. As a result, wear resistance to all kinds of arduous treatment is markedly improved. The tread is also flatter—to give an increased contact area—and has a pattern of shallow dimples which give an indication of wear.

Electro-Hydraulics, Ltd., Liverpool Road, Warrington, Lancs. (Stand 76), are the producers of the Victor undercarriage (it will be shown in the outdoor exhibition at Farnborough). This superb piece of engineering fills a most difficult requirement, for the great weight of the Victor bomber is supported on a main undercarriage which retracts into a thin wing. Each main leg has four double-tyred wheels, and very careful design has kept weight to a minimum; in fact it is the company's proud boast that the complete undercarriage installation for the Victor weighs no more than three per cent of the aircraft all-up weight.

The outdoor exhibit will feature a main bogie mounted on a dummy section of Victor wing, into which it will retract under control from a demonstration control box. The "three per cent" includes the nose unit, with twin steering jacks and hydraulic steering panel mounted on the main casting.

The Goodyear Tyre and Rubber Co. (Great Britain), Ltd., Wolverhampton (Stand 58), now have their new Aviation



Teddington nitrogen/air valve.

Division factory at Wallasey producing to augment the flow of tyres, wheels and brakes from the parent factory.

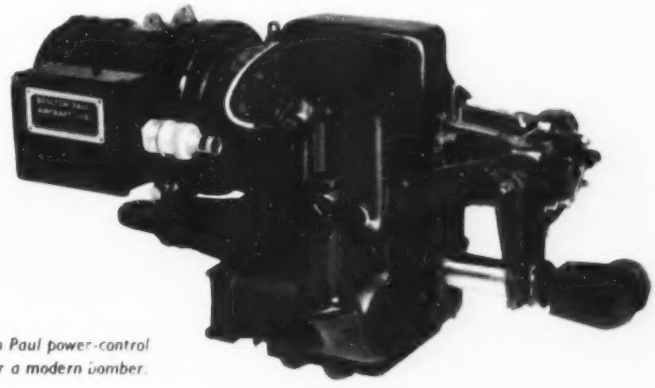
Two wheel and brake assemblies are of particular interest. The first, illustrated on page 337, is an automatic unit for use in heavy and faster aircraft, in which brake requirements are exceptionally severe. The dual-disc brake is actuated by four cylinders, and is unique in that it is contained entirely within the wheel. This total enclosure confers numerous advantages; the discs are cooled and ventilated by airflow through the wheel. The weight of this wheel, tyre and brake unit is 446 lb: it is used on the Martin B-57A.

The other automatic brake assembly is more conventional in pattern, but it will be shown at Farnborough in conjunction with a wheel of the new Goodyear "wave" type. This was originally a development by the American branch of the company, in response to a requirement for a wheel which could be forged in magnesium alloy. In place of radial spokes the wheel has a disc which is corrugated—each corrugation running radially—into a wave pattern. The example shown will, in fact, be cast but, whether cast or forged, the design shows great promise in carrying increased loads for a reduced weight (332 lb, in the case of the type shown).

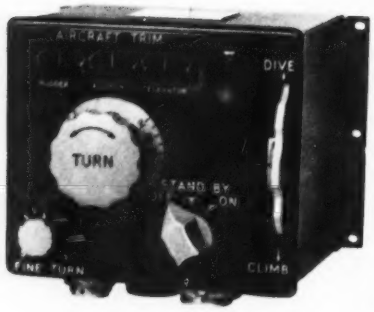
A Farnborough exhibit will be a demonstration of Goodyear automatic braking control. Based upon the maintenance of full braking so long as a set deceleration is not exceeded, the "A.B.C." system centres about a generator and control box, the latter being shown sectioned so that its operation can be studied.

The Lockheed Hydraulic Brake Co., Ltd., Leamington Spa (Stand 35), continue to design oleo-pneumatic shock-absorber struts for the undercarriages of all types of aircraft. All these units employ air springing, and the fluid is kept remote from the compressed air, so preventing aeration. Weight is kept down by using light alloys whenever possible.

The biggest recent production of these legs has probably been for the various



Boulton Paul power-control unit for a modern bomber.



Sperry Mk. 11 autopilot controller.

PROPRIETARY EQUIPMENT

types of Vampire and Venom; other struts have been designed for the Avro 707s and Blackburn Beverley. Lockheed nosewheel steering is used on the Beverley and Comet. One unit to be shown is a typical combined steering jack and shimmy damper. It allows no less than 180 deg of powered steering angle and centres itself immediately the steering control is released.

The Palmer Tyre, Ltd., Penfold Street, London, N.W.8 (*Stand* 107), are devoting much of their energies towards the development of landing gear for rotary-wing aircraft. In such applications, the undercarriage should not have to stand up to high touch-down speeds and prolonged taxying; Palmer helicopter wheels are, therefore, fitted with plain bearings—much simpler and lighter than the more usual ball race—and most of these bearings are lined with oil-impregnated sintered metal.

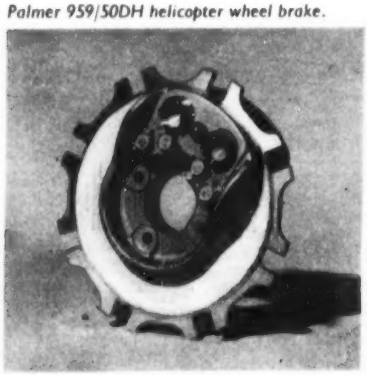
Wheel Type 959D (Bristol Sycamore) has a lugged outer flange to provide a drive to the Palmer helicopter disc brake, which fits snugly into the wheel to reduce drag. This brake, Type 959/50, is rather lighter and of lower heat-absorption capacity than are units for fixed wing aircraft. But it is quite adequate for all service conditions, such as alighting on the steeply-sloping deck of an aircraft carrier in a heavy sea.

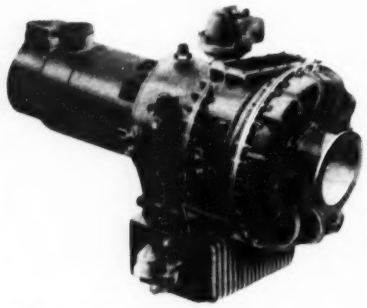
Powered Controls and Autopilots

Boulton Paul Aircraft, Ltd., Wolverhampton (*Stand 1*), have developed powered flying controls over a period of some six years. All belong to the same basic family. Movement of the pilot's controls actuates the input lever of a control unit and opens a servo valve. The latter passes fluid from a variable-displacement pump—continuously driven in flight by an electric motor—to the jack or motor connected to the appropriate control surface.

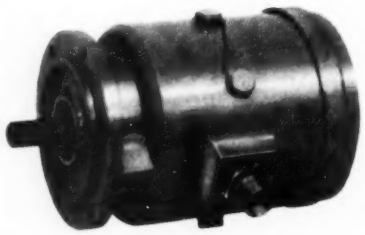
The feedback linkage from the surface returns the control valve to neutral as soon as the selected deflection is reached. The whole system is precise in operation, maximum rate of deflection being produced by a movement of the pilot's hand of about one inch; output movement is correct within a displacement of one-thousandth of an inch on the input lever, and time lag is not greater than some 0.05 sec.

Palmer 959/50DH helicopter wheel brake.





Godfrey 15 kVA turbo-alternator set.



Lockheed double-capacity Mk. 8 pump.

These units are designed individually to meet the operational requirements of particular types of aircraft. Unfortunately all the important aircraft in which B.P.A. units are fitted are on the Part Publication list, with the single exception of the Saro Princess. Readers may like to consider which of the "V-bombers" might house the unit shown on the previous page.

Elliott Brothers (London), Ltd., Century Works, Lewisham, London, S.E.13 (Stand 128), have, in collaboration with the R.A.E., developed an autopilot for the Jindivik pilotless aircraft now in production in Australia. This aircraft is radio controlled from the ground, or from a "mother" aircraft, and the control signals are passed to this Elliott autopilot in order to govern the Jindivik's flight with accuracy.

Specially produced for this high-speed application, the system permits extreme manœuvrability with fully co-ordinated turns over a wide range of airspeeds and altitudes, and a particular feature is the automatic selection of a suitable attitude for landing.

Another development of Elliott's Aero Division is an autostabilizer for the suppression of high-frequency yawing oscillations of high-speed aircraft. A rate-gyro produces a voltage proportional to the rate of yaw, which is then suitably phase-advanced to match the aircraft characteristics and amplified by a magnetic amplifier in the control unit. The output from the amplifier then commands a quick response electric servomotor. Both fighter and pilotless aircraft may be assumed to benefit from this work.

H. M. Hobson, Ltd., Fordhouses, Wolverhampton (*Stand 98*) are now manufacturing guidance systems and powered controls for pilotless aircraft and missiles, in addition to their better-known work in the development of powered controls for crewed aircraft. Two examples from their range of guided-missile servo-control units have now been cleared for public display.

In the field of powered controls for manned aircraft, one of the latest Hobson circuits incorporates an artificial feel simulator, which prevents overloading of the aircraft structure at high speed and also improves the behaviour of the system from the pilot's point of view, without losing any fidelity of response.

Smiths Aircraft Instruments, Ltd., Cricklewood Works, London, N.W.2 (*Stand 2*). A most important new development is the S.E.P.2 autopilot, which follows the S.E.P.1—now backed by thousands of hours in Comets and Viscounts and six years on the air lines. The operating system remains a rate/rate system using spring-suspended gyros to detect change of aircraft attitude. These gyros transmit a signal which, after passage through a magnetic amplifier, energize the flying-control servomotors in such a way that correction of disturbance is proportional to the rate and acceleration at which it occurs.

Smiths believe that the S.E.P.2 was the first electronic autopilot to be developed in which thermionic valves are totally excluded. The magnetic amplifiers have shown themselves to be much lighter and more flexible in use than the former units, and greater reliability is also expected. The main operational features of the new autopilot are: smooth and accurate stabilization of the aircraft; continuous maintenance of a prescribed pitch and roll datum and compass heading: the maintenance of any desired barometric height by the operation of a single switch; the execution of co-ordinated manœuvres from the pilot's controller; and the integration of V.O.R. or I.L.S. systems, upon their selection by the pilot.

The Sperry Gyroscope Co., Ltd., Great West Road, Brentford, Middx. (*Stand 145*), have, in collaboration with the auto-control section of the R.A.E., Farnborough, evolved a completely new range of precision autopilots, under M.o.S. contract. The new family is intended for use in high-speed aircraft, in which the stability and control requirements demand an autopilot of very high performance. The first of the series is the Mk. 11 unit.

The system is based upon 3-axis control, effected electro-hydraulically, the servos being of a high-efficiency hydraulic ram type. All axes are damped, and long-term accuracy of control is maintained against changes of trim on any axis by the use of integral of error terms. As a safety feature, any failure that might result in a "hard-over" signal causes the automatic disengagement of the autopilot.

The unit can be fed to maintain flight at constant altitude, attitude and heading, the two latter being governed by gyro-vertical

Goodyear wheel and brake for B-57A.

PROPRIETARY EQUIPMENT

and the gyro-magnetic compass. The installation is very flexible and can be used to make accurate co-ordinated turns at all airspeeds; V.O.R. coupling is provided, and also an automatic approach feature with radio displacement signals, azimuth being damped to compass heading and pitched being governed by gyro-vertical.

The series is now going into production for a number of new aircraft for the Royal Air Force and Fleet Air Arm. It is also clear that, with its combination of high-performance, flexibility and low installed weight, the basic system will find obvious application in new airliners.

Power Services

The British Thomson-Houston Co., Ltd., Rugby (Stand 101), have chosen as their main exhibit a schematic representation of the electrical system of the Comet. This system, together with all the related components, forms the entire background to the stand.

Each engine drives an 8.5 kVA alternator, giving three-phase current at 400 cyc/sec at around 8,000 r.p.m. All the A.C. output is rectified to 24 V (nominal) D.C., the four rectifiers being paralleled to provide a total D.C. current of 1,000 amperes. Auxiliary A.C. supplies are then obtained from motor-generators or inverter sets, giving 26 V, single-phase, 400 cyc/sec; 115 V, three-phase, 400 cyc/sec; and 115 V, single-phase, 1,600 cyc/sec.

Electro-Hydraulics, Ltd., Liverpool Road, Warrington, Lancs. (Stand 76), have brought out the new "Monomatic" hydraulic system. This is claimed both to reduce pipe weights, and to provide for emergency operation in the event of either engine- or pipe-failure. A demonstration rig for the S.B.A.C. exhibition will show the effect of deliberately introducing any selected faults.

Evidence of an excellent standard in hydraulic reliability will be given by the display of jack pistons and cylinders which have completed 100,000 operations at full working pressure of 4,000 lb/sq in, without any leakage or dismantling for the changing of seals.

The Hymatic Engineering Co., Ltd., Redditch, Worcs. (Stand 38), continue to develop airborne pneumatic system components of all types. Special attention is being given to the development of precision pressure-reducing valves, particularly for use in tank-pressurization circuits utilizing hot air bled from the main engine compressor.

During the past year the constant low-pressure output from these valves has been almost doubled, without any penalty in weight, size or pressure-tolerance. The PS48 series, for example, weigh no more than 1.4 lb although a tolerance of ¼ lb/sq in is maintained for flows up to 20 c.f.m. and control is only slightly less precise at the maximum of 100 c.f.m. This valve reduces bleed air at over 200 lb/sq in to a stabilized delivery pressure of from 1 to 35 lb/sq in, over a temperature range from —40 to 250 deg C.

Working in conjunction with such reducing valves, or separately, a new range of tank venting and relief valves has been produced, of which the RV22 will be shown. Their use maintains a constant pressure-difference across the wall of the tank in all conditions of flight.

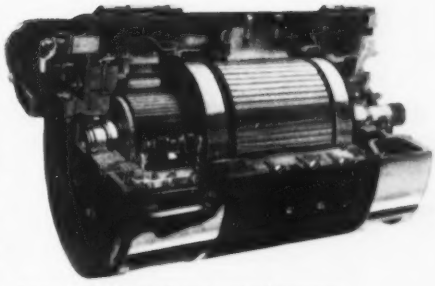
The Lockheed Hydraulic Brake Co., Ltd., Leamington Spa (Stand 35), have "doubled up" two pumping elements of the world-famous Mk. 7 hydraulic pump to form a new unit of twice the capacity. Known as the Mk. 8, and illustrated on page 336, the new pump thus has 14 plungers in two rows so arranged that the balanced two-eccentric shaft pumps a steady flow, free from pressure pulsing.

This compact pump is not fitted with any off-loading, or other auxiliary features, and weighs but 14 lb; it is claimed to run "noticeably cool" when delivering a steady 5 gal/min at full load. It is going into production for "some of our most significant aircraft."

Complementary to this pump is the development of a range of hydraulic components suitable for use with non-inflammable hydraulic fluids. Stand 35 will carry a complete layout of a "safety" hydraulic system, for which a suitable pump has been type-tested and the lubrication and corrosion characteristics explored during protracted running. Lockheed have found it possible to retain seals of natural rubber, which retain their resilience under low-temperature conditions.

Integral, Ltd., Birmingham Road, Wolverhampton, Staffs. (Stand 97), have recently evolved the Type 180 hydraulic pump, which was the first such unit ever to pass a M.o.S. type-test with non-inflammable fluid. Developed from the well-known Type 116, the new pump remains a seven-cylinder radial unit, fed from a gear stage to obtain a good high-altitude performance. To permit the use of safety fluids—Esso E.E.L.6 is currently specified—bearing areas have been increased and the design has been generally cleaned up until it is, in fact, lighter and stronger than its predecessor.

British Messier main undercarriage.



Rotax 22.5 kW combined starter/generator.

This pump will be exhibited next week together with a very neat electrically driven pump for the emergency powering of aircraft flying-control systems. Many modern aircraft cannot be flown manually, and complete engine failure could, therefore, mean complete loss of control. To stretch out its use to the utmost by cutting down on accumulator consumption, the new Integral pump is as small as it could be made. Incorporating its own cut-out, the unit is a gear-fed piston pump, working at 4,000 lb/sq in.

Rotax, Ltd., Willesden Junction, London, N.W.10 (Stand 158), continue to manufacture complete electrical systems for all types of aircraft. Some idea of the power requirements of modern high-performance aircraft is given by the fact that the company has, during the past year, developed a three-phase alternator rated at no less than 75 kVA. Over a speed range of nearly 3:1 the set will maintain this rating which, in conjunction with a transformer and rectifier, makes possible the supply of a final 112-volt d.c. output of 60 kW. Particularly noteworthy is the fact that, when driven at a constant speed of 8,000 r.p.m. this alternator is uprated to 135 kVA.

One Farnborough exhibit, in sectioned form to show the interpole and pole-face windings, will be a combined starter and generator, rated at 22.5 kW at 112 V. Already in use in large modern military aircraft, this equipment is very neat and is illustrated on this page; as a starter it can be used with turbojets of up to 9,000 lb thrust.

To meet the increasing demand for constant-frequency A.C. supplies, Rotax are manufacturing several types of constant-speed alternator drive. Where the A.C. loading does not exceed 2.5 kVA a range of inverters and control panels is available; another development during the past year is a 3 kW (D.C.) rotary transformer, which is already in production.

Standard Telephones and Cables, Ltd., Connaught House, Aldwych, London, W.C. 2 (Rectifier Division, Stand 183). In the electric-power field Standard make the SenTerCel series of lightweight selenium rectifiers, which are used in very many modern aircraft. Special methods of construction and the use of high-voltage aluminium plates combine to minimize the weight and bulk of these units.

A typical example is the three-phase, bridge-connected rectifier, designed to provide two simultaneous outputs of 300 amperes and 50 amperes, both at 28 V, with a power/weight ratio of 0.93 kW/lb, when forced-air-cooled at 2,000 ft/min.

Standard point out that space can frequently be saved by mounting several electrically separate rectifier stacks on a common spindle, and a number of such units will be on view, all having been designed to the requirements of particular customers.

THE AIRCRAFT INDUSTRY

IN the following twelve pages are entries constituting a directory to the names, addresses and principal products of some 400 British firms contributing directly or indirectly to the construction and maintenance of civil and military aircraft. Covering a wider field, this section of our special number is supplementary to the preceding pages, where, under the heading "Proprietary Equipment," major aircraft installations at the S.B.A.C. display, Farnborough, such as airscrews and hydraulic systems, are reviewed. Constructors of complete aircraft and engines are listed below, with their addresses; for data on their products the reader is referred to the main reviews on earlier pages of this issue. In the directory columns which follow, ancillary materials and products are reviewed, broadly classified under thirteen main headings. In certain cases, where the work of an individual firm falls under two or more headings, cross-references are made to the section in which the details are given. For firms exhibiting at the S.B.A.C. Show, stand numbers are given at the end of the applicable paragraphs. On p. 350 is a plan of the exhibition hall.

AIRCRAFT

AIRSPEED.—See de Havilland Aircraft Co., Ltd.

ARMSTRONG WHITWORTH AIRCRAFT, LTD., SIR W. G., Baginton, nr. Coventry (Tollbar 2261). **S.B.A.C. Stand O.**

AUSTER AIRCRAFT, LTD., Rearsby Aerodrome, nr. Leicester (Rearsby 276). **S.B.A.C. Stand 193.**

BLACKBURN AND GENERAL AIRCRAFT, LTD., Brough, E. Yorkshire (Brough 121). **S.B.A.C. Stand K.**

BOULTON PAUL AIRCRAFT, LTD., Wolverhampton (Fordhouses 3191). **S.B.A.C. Stand I.**

BRISTOL AEROPLANE CO., LTD., Filton House, Filton, Bristol (Filton 3831). **S.B.A.C. Stand N.**

DART AIRCRAFT, LTD., The Market Place, Chalfont St. Peter, Bucks (Gerrards Cross 3881).

DE HAVILLAND AIRCRAFT CO., LTD., THE, Hatfield, Herts (Hatfield 2345). **S.B.A.C. Stand H.**

DE HAVILLAND AIRCRAFT PROPRIETARY, LTD., Box 30, P.O. Bankstown, N.S.W.

DE HAVILLAND AIRCRAFT OF CANADA, LTD., THE, Postal Station "L," Toronto, Ontario.

ELLIOTTS OF NEWBURY, LTD., Albert Works, Newbury, Berks. (Newbury 312).

ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, London, W.C.2 (Holborn 6966). **S.B.A.C. Stands Q, 132.**

FAIREY AVIATION CO., LTD., Hayes, Middlesex (Hayes 3800). **S.B.A.C. Stand E.**

FOLLAND AIRCRAFT, LTD., Sydney Lodge, Hamble, Hants (Hamble 3191).

GLOSTER AIRCRAFT CO., LTD., Hucclecote, Glos (Gloucester 66294). **S.B.A.C. Stand O.**

HANDLEY PAGE, LTD., Claremont Road, Cricklewood, London, N.W.2 (Gladstone 8000).—**S.B.A.C. Stand D.**

HANDLEY PAGE (READING), LTD., The Aerodrome, Woodley, nr. Reading, Berks (Sonning 2211).

HAWKER AIRCRAFT, LTD., Canbury Park Road, Kingston-on-Thames, Surrey (Kingston 1044).—**S.B.A.C. Stand O.**

HESTON AIRCRAFT CO., LTD., THE, Heston Airport, Hounslow, Middlesex (Southall 2321).

F. G. MILES, LTD., Shoreham Airport, Shoreham-by-Sea, Sussex (Shoreham-by-Sea 2301).

PERCIVAL AIRCRAFT, LTD., The Airport, Luton, Beds (Luton 6060).—**S.B.A.C. Stand G.**

ROE AND CO., LTD., A. V., Greengate, Middleton, Manchester (Failsworth 2020).—**S.B.A.C. Stand O.**

ROE (CANADA), LTD., A. V., Malton, nr. Toronto, Ontario.—**S.B.A.C. Stand J.**

SAUNDERS-ROE, LTD., East Cowes, I.O.W. (Cowes 445).—**S.B.A.C. Stand J.**

SCOTTISH AVIATION, LTD., Prestwick Aerodrome, Ayrshire (Prestwick 79888).—**S.B.A.C. Stand 82.**

SHORT BROS. AND HARLAND, LTD., Seaplane Works, Queens Island, Belfast (Belfast 58444).—**S.B.A.C. Stand L.**

SLINGSBY SAILPLANES, LTD., Ings Lane, Kirbymoorside, Yorks (Kirbymoorside 312, 313).

SUPERMARINE.—See Vickers-Armstrongs.

VICKERS-ARMSTRONGS, LTD., Vickers House, Broadway, London, S.W.1 (Abbey 7777).—**S.B.A.C. Stand A.**

WESTLAND AIRCRAFT, LTD., Yeovil, Somerset (Yeovil 1100).—**S.B.A.C. Stand M.**

ENGINES

ALVIS, LTD., Holyhead Road, Coventry (Coventry 5501).—**S.B.A.C. Stand F.**

ARMSTRONG SIDDELEY MOTORS, LTD., Parkside, Coventry (Coventry 62666).—**S.B.A.C. Stand O.**

BLACKBURN AND GENERAL AIRCRAFT, LTD., Engine Division, Brough, Yorks (Brough 121).—**S.B.A.C. Stand K.**

BRISTOL AEROPLANE CO., LTD., Engine Division, Filton House, Filton, Bristol (Filton 3831).—**S.B.A.C. Stand N.**

BROCKWORTH ENGINEERING CO., LTD., Hucclecote, Gloucester (Gloucester 21531). (Production Unit for Armstrong Siddeley Motors, Ltd.)

DE HAVILLAND ENGINE CO., LTD., Stonegrove, Edgware, Middlesex (Edgware 2300).—**S.B.A.C. Stand H.**

NAPIER AND SON, LTD., D., The Vale, Acton, London, W.3 (Shepherds Bush 1220).—**S.B.A.C. Stand B.**

ROE (CANADA), LTD., A. V., Gas Turbine Division, Box 430, Terminal "A," Toronto, Ontario.

ROLLS-ROYCE, LTD., Nightingale Road, Derby (Derby 42424).—**S.B.A.C. Stand C.**

STANDARD MOTOR CO., LTD., Banner Lane, Coventry (Coventry 66611). (Production Unit for Rolls-Royce, Ltd.)

MATERIALS

(Including Metals, Castings and Forgings, etc.; Wood and Plastics, excluding Finished Parts)

ACCLES AND POLLOCK, LTD., Oldbury, Birmingham (Broadwell 1797).—Manipulated tubes; movable joints; precision tubes in stainless steel and Monel. **S.B.A.C. Stand 159.**

AERO RESEARCH, LTD., Duxford, Cambridge (Sawston 187).—"Redux" bonding process for metal aircraft structures; "Araldite" epoxy resins as adhesives for metals, casting resins, surface coatings and fillers; "Aerolite" glues for wood structures.

AIRCRAFT MATERIALS, LTD.—See under "Aircraft Parts."

ALMIN, LTD., Farnham Royal, Bucks (Farnham Common 595).—"Almin" aluminium alloys in all forms.

ASHDOWNS, LTD.—See under "Aircraft Parts."

BAKELITE, LTD., 12-18 Grosvenor Gardens, London, S.W.1 (Sloane 0898).—Bakelite moulding materials; laminated sheet, rod and tube; resins; adhesives; Vybak P.V.C. moulding and extrusion compounds, rigid and flexible sheet. **S.B.A.C. Stand 117.**

BALFOUR AND CO., LTD., ARTHUR, Capital Steel Works, Sheffield 3 (Sheffield 22071).—High-speed steels, alloy tool steels and plain carbon tool steel in bars and forgings. Engineers' small tools, e.g., drills, reamers, milling cutters, "Balfalloy" tipped tools, butt-welded high-speed steel lathe tools, hacksaw blades, etc., etc.—**S.B.A.C. Stand 186.**

BAMBERGERS, LTD., 27/28, Finsbury Square, London, E.C.2 (Monarch 4466).—Specialists in hardwood, softwood and plywood for aircraft construction.

B. B. CHEMICAL CO., LTD., Ulverscroft Road, Leicester. (Leicester 20175).—Manufacturers of "Bostik" adhesives and sealing compounds for pressurizing cabins, sealing integral tanks, windscreen glazing etc.

BELL'S ASBESTOS AND ENGINEERING, LTD.—See under Aircraft Parts."

BIRKETT AND SONS, LTD., T. M., Hanley, Stoke-on-Trent, Staffs (Stoke-on-Trent 2184-5-6-7).—A.I.D. and A.R.B. approved. Non-ferrous castings; precision machined parts; chill-cast rods and tubes.

BIRMETALS, LTD., Woodgate Works, Birmingham. 32 (Woodgate 2253).—Light alloy sheet, strip, extruded sections, rod, bar, tube and wire, including the "Birmabright" series; also magnesium-base alloy sheet, strip, extrusions and tube. **S.B.A.C. Stand 33.**

BOLTON AND SONS, LTD., THOMAS.—See under "Aircraft Parts."

BOOTH AND CO., LTD., JAMES, Argyle Street Works, Nechells, Birmingham, 7 (East 1521).—Extruded sections, tube, sheet, strip and forgings in aluminium alloys, brass and copper. **S.B.A.C. Stand 148.**

BRITANNIA TUBE CO., LTD., Glover Street, Birmingham (Victoria 0192).—A.I.D. and A.R.B. approved. Aluminum and alloy tubes, sections; manipulations; carbon and stainless-steel tubes, close joint, open joint. Fabrications.

BRITISH ALUMINIUM CO., LTD., Norfolk House, St. James's Square, London, S.W.1 (WHItehall 7868).—Producers of aluminium and aluminium-alloy ingot, plate, sheet, strip and tube to B.S. aircraft and D.T.D. specification. **S.B.A.C. Stand 59.**

BRITISH BELTING AND ASBESTOS LTD., Cleckheaton, Yorkshire, (Cleckheaton 800).—Manufacturers of brake and clutch liners, parachute and equipment webbing, compressed asbestos fibre joints and jointing to D.T.D. specifications, solid woven asbestos tape, hollow braided tubing and anti-friction bearings. **S.B.A.C. Stand 142.**

BROWN BAYLEY STEELS, LTD., Sheffield 9 (Sheffield 41031).—Alloy and heat-resisting steels for aircraft and aircraft components. Black and bright bars; forgings; heat-resisting sheet and strip; rolled or forged steel rings. **S.B.A.C. Stand 224.**

BROWN BROTHERS (AIRCRAFT), LTD.—See under "Aircraft Parts."

CAPE ASBESTOS CO., LTD., 114-116 Park Street, London W.1 (Grosvenor 6022).—Asbestos plastics in sheet, moulded and machined form. Moulded brake and clutch linings.

CARRON PARLANTI, LTD., Carron, Falkirk, Stirlingshire (Falkirk 35); London Office: 15 Upper Thames Street, E.C.4 (Central 7581).—"Niforge" castings, of high tensile-strength and fine surface finish, for turbine blades, couplings, pump bodies, etc., produced by the Parlanti mould process, using "temperature-graded" anodized aluminium-alloy dies. **S.B.A.C. Stand 61.**

COLEY AND SON (HOUNSLOW), LTD., R. J., Chapel Road, Hounslow, Middlesex (Hounslow 2266/7/8).—Metal merchants, specialists in all types of aircraft scrap and redundancies. Branches at Manchester.

COOPERS MECHANICAL JOINTS, LTD.—See under "Aircraft Parts."

DANCER AND HEARN BROS., LTD.—See under "Aircraft Parts."

ENGLISH STEEL CORPORATION, LTD., River Don Works, Sheffield, 9 (Sheffield 41071), and North Street Works, Openshaw, Manchester (Manchester East 1371).—Drop-forged parts from special aero steels for gas-turbine engines; crankshafts; airscrew shafts and hubs; landing-gear parts; gears. Engineers' cutting tools. **S.B.A.C. Stand 100.**

ENTHOVEN AND SONS, LTD., H. J., 89 Upper Thames Street, London, E.C.4 (Mansion House 4533).—Manufacturers of lead and lead alloys, solid solders, cored solders, solder specialities and fine chemicals. **S.B.A.C. Stand 213.**

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Union Aéromaritime de Transports

The de Havilland Enterprise leads

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Saudi Arabian Airlines

Air-India

Air Vietnam

Royal Norwegian Air Force

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West African Airways Corporation

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Union of Burma Airways

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GIPSY QUEEN 30 · GIPSY QUEEN 70 · COMET · HERON · DOVE · DEVON · AMBASSADOR

Burmese Air Force

Empresa Nacional de Helices para Aeronaves

Alitalia

Hunting Air Transport

Braathen's South American and Far East Air Transport

Royal Iraqi Air Force

East African Airways

South African Airways

Lineas Aereas Españolas

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in the world-wide distribution

Field Aircraft Services

Linea Aerea Nacional (Chile)

Royal Pakistan Air Force

Pacific Airmotive Corporation

Royal Australian Air Force

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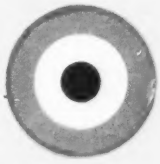

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Central African Airways

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Royal Thai Air Force

Trans-Oceanic Airways (Australia)

Arab Airways Association

Royal Belgian Air Force

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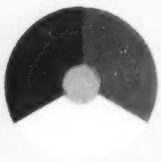

Royal Netherland Air Force

Sabena (Belgium)

Hindustan Aircraft

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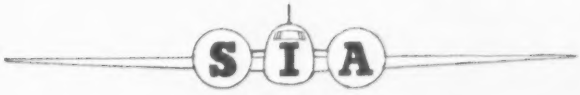
Karkumaki Airways (Finland)

Dominican Air Force

Governor-General of the Belgian Congo



Suidair (South Africa)

Syrian Air Force

Air India International

S.A.T.A. (Azores)

British European Airways

Indonesian Air Force

gas-turbine and piston engines and

Aer Lingus

Flota Aerea Mercante Argentina (FAMA)

Trans-Canada Air Lines

South African Air Force

Pluna (Uruguay)

Société Nationale des Constructions Aéronautiques du Sud-Ouest

Royal Egyptian Air Force

Morton Air Services

Turkish Air Lines

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Flight, 4 *September* 1953

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Jersey Airlines

Airlines (Western Australia)

D.N.L. (Denmark)

Garuda Indonesian Airways

Air France

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C.A.S.A. (Spain)

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Cyprus Airways

Southern Rhodesian Air Force

British West Indian Airways

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French Air Force

West Norway Airlines

British Commonwealth Pacific Airlines

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THE AIRCRAFT INDUSTRY . . .

Materials (continued)

FERODO, LTD., Chapel-en-le-Frith, via Stockport (Chapel-en-le Frith 250).—Brake linings, stair-treads, "Ferobestos" plastics.

FIBREGLASS, LTD., Ravenhead, St. Helens, Lancs (St. Helens 4224).—"Fibreglass" products for heat, sound and electrical insulation in aircraft, and "Fibreglass" reinforced plastics. **S.B.A.C. Stand 135.**

FIRTH AND JOHN BROWN, LTD., THOS., Atlas Works, Sheffield, 4 (Sheffield 20081).—Alloy and special steels in bars, billets and forgings. Drop-forgings for turbo-jet engines; crankshafts, gears, etc., in aircraft steels. **S.B.A.C. Stand 156.**

FIRTH-VICKERS STAINLESS STEELS, LTD., Staybrite Works, Sheffield, 9 (Sheffield 42051).—"Staybrite", stainless, heat- and creep-resisting aircraft steels—sheet, bars, strip; centrifugally-cast, centri-die-cast and precision-cast components for gas turbines. **S.B.A.C. Stand 160.**

FLATHER, LTD., W. T., Standard Steel Works, Tinsley, Sheffield, 9 (Sheffield 41152).—Steels for airframe and engine components; steels for jigs and tools; case-hardening compounds. **S.B.A.C. Stand 105.**

FLEXO PLYWOOD INDUSTRIES, LTD., Hall Lane, South Chingford, London, E.4 (Silverthorn 2666.—Sandwich constructions of all kinds (insulating—high strength-weight ratio). Glass and resinated asbestos laminates and mouldings.

FOX AND CO., LTD., SAMUEL, Stockbridge Works, nr. Sheffield (Sheffield 40871). — Stainless and Special alloy steels for high-temperature service. **S.B.A.C. Stand 50.**

GARRINGTONS, LTD.—See under "Aircraft Parts."

GENERAL ELECTRIC CO., LTD.—See under "Factory and Airfield Equipment."

GILLOTT AND SONS, JOSEPH, Sheffield, 11 (Sheffield 74423).—Die steels, high-speed-tool and alloy steels.

GOSHERON AND CO., LTD., JOHN.—See under "Aircraft Parts."

HABERSHON AND SONS, LTD., J. J., Holmes Mills, Rotherham, Yorks (Rotherham 2081/6).—Steels to aircraft specifications, in hot- and cold-rolled strip; sheets, bars and sections. **S.B.A.C. Stand 125.**

HALL AND HALL, LTD., Oldfield Works, Hampton, Middlesex (Molesey 2180).—Natural and synthetic rubbers to various Ministry of Supply specifications; technical mouldings and extrusions for aircraft work; hydraulic seals and jointing materials. **S.B.A.C. Stand 199.**

HALL AND PICKLES, LTD., Port Street, Manchester (Central 4571).—"Hydra," "Hydraloy" hard metal, "Hydraweld" butt-welded tools, standards and specials. Tool bits. High-speed, alloy, cast, and stainless steels. Stainless and heat-resisting wire. **S.B.A.C. Stand 214.**

HEADLAND, LTD., THOS. P.—See under "Aircraft Parts."

HIGH DUTY ALLOYS, LTD., Slough, Bucks (Slough 23901).—Castings, forgings, stampings, pressings and extrusions in "Hiduminium" and "Magnuminium" aluminium and magnesium alloys. Compressor blades in "Hiduminium", aluminium bronze and Nimonic. **S.B.A.C. Stand 150.**

HORDERN-RICHMOND, LTD, Haddenham, Bucks. (Aylesbury 1100).—"Hy-du-lignum" laminated compressed wood; "Hy-du-lignum" and glass laminates jigs and tools; helicopter rotor blades: wind-tunnel fans; Aeronautic propellers. **S.B.A.C. Stand 177.**

HUGHES-JOHNSON STAMPINGS, LTD., THE, Langley Green, Birmingham (Broadwell 1361).—Drop-forgings of the more intricate type, in carbon, nickel, nickel-chrome and all alloy steels: non-ferrous high-nickel-chrome alloys: Copper, aluminium alloys and titanium alloys. **S.B.A.C. Stand 226.**

IMPERIAL CHEMICAL INDUSTRIES, LTD. (Metals Division), Kynoch Works, Witton, Birmingham (Birchfields 4848).—Sheet, strip, plates, extrusions, wire and tubes in copper and copper alloys; sheet, strip, plates and extrusions and tubes in aluminium and aluminium alloys.

IMPERIAL CHEMICAL INDUSTRIES, LTD. (Plastics Division).—See under "Aircraft Parts."

INDUSTRIAL TAPES, LTD., Speedfix House, Duke's Road, London, W.C.1 (Euston 3718).—"Speedfix" self-adhesive tapes, plain and printed, in cellulose, cloth, paper, P.V.C., ethyl acetate, etc.

JABLO PROPELLERS, LTD., Mill Lane, Waddon, Croydon, Surrey (Croydon 2201). — Propeller, helicopter-blade, lightweight bulkhead and flooring materials; Jabroc tools; sandwich panels with Aero Jablex core; glass fabric facings: thermal and sound insulation. **S.B.A.C. Stand 143.**

JESSOP AND SONS, LTD., WILLIAM, Brightside Works, Sheffield (Sheffield 41352).—Special alloy and tool steels, constructional steels, valve steels, high-temperature steels, permanent magnets, forged or drop-stamped gas-turbine discs, forged or precision-cast blades. **S.B.A.C. Stand 41.**

KAYE, LTD., E. AND E., Ponders End, Enfield, Middlesex (Howard 1601).—Aluminium alloy bars, tubes and extruded sections. Copper and aluminium wire strip and strand. Paper- and cotton-covered winding wires. A.I.D. and A.R.B. approved.

KAYSER, ELLISON AND CO., LTD., Carlisle Steel Works, Sheffield, 4 (Sheffield 22124).—High-grade tool, high-speed, alloy, stainless and free-cutting steels, and heat-resisting steels for internal combustion engines.

KENILWORTH MANUFACTURING CO., LTD., "Hermetite" Works, West Drayton, Middlesex (West Drayton 3047).—A.I.D. and A.R.B. approved. Hermetite jointing compounds; plastic jointing for sealing spot-welded joints; hydraulic fluids; metal cement; aluminium paints. **S.B.A.C. Stand 184.**

KENT ALLOYS, LTD., Rochester, Kent (Strood 7674).—Sand, die and shell castings to A.I.D. specs.; aluminium, magnesium, magnesium-zirconium and copper alloys; iron; machining; Argon Arc welding; X-Ray; Gamma ray; final assemblies. **S.B.A.C. Stand 74.**

KLINGER, LTD., RICHARD.—See under "Aircraft Parts."

LLEWELLYN RYLAND, LTD.—See under "Paints and Finishes."

LOW MOOR ALLOY STEELWORKS, LTD., Low Moor, Bradford (Low Moor 663).—High-speed steel, tool steel, special steel, corrosion- and heat-resisting steels, in ingots, blooms, billets, slabs, sheets, strip, bar (flat, square and rounds), wire, rod, etc. **S.B.A.C. Stand 180.**

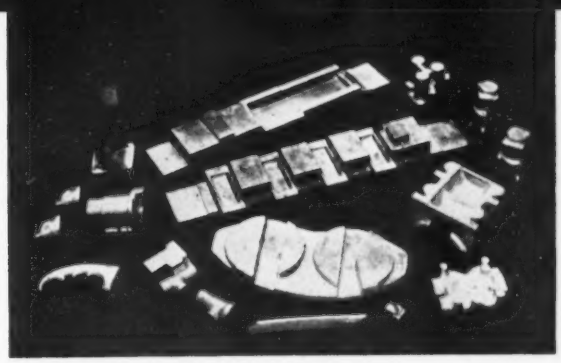
LOW MOOR FINE STEELS, LTD., Low Moor, Bradford (Low Moor 1544/7).—Special steel extrusions. **S.B.A.C. Stand 179.**

MAGNESIUM ELEKTRON, LTD., Clifton Junction, Manchester (Swinton 2511).—Castings in Elektron magnesium-base zirconium- and thorium-containing alloys. Sheet, extrusions and forgings. Components fabricated from sheet and extrusions. **S.B.A.C. Stand 49.**

MILLS, LTD., WILLIAM, Friar Park Road, Wednesbury, Staffs (Stonecross 2276/7/8).—Aluminium-alloy founders: sand, gravity-die and pressure-die castings for aircraft and other industries. A.I.D. and A.R.B. approved.

MINNESOTA MINING AND MANUFACTURING CO., LTD., Arden Road, Adderley Park, Birmingham, 8 (East 2051). — 3M coated abrasives, 3M adhesives, "Scotch Boy" pressure-sensitive tapes. Cellulose tape — masking, electrical, etc. "Safety-Walk" non-slip surfacing.

MOND NICKEL CO., LTD., Sunderland House, Curzon Street, London, W.1 (Grosvenor 4131).—Nickel refiners: fabrication of nickel alloys and nickel-containing materials. **S.B.A.C. Stand 146.**



Castings, including turbine blades, by the Carron Parlanti Company.

NEWMAN INDUSTRIES, LTD.—See under "Electrical."

NORTHERN ALUMINIUM CO., LTD., Bush House, Aldwych, London, W.C.2 (Temple Bar 8430).—Noral aluminium and aluminium alloy sheet, strip, plate, sections, tubes, rod, bar, wire, forgings, castings; Alpaste for paint. **S.B.A.C. Stand 138.**

OMES, LTD., Beverley Works, Barnes, London, S.W.13 (Prospect 2291).—Producers of electro-upset forgings for aircraft and gas turbines, A.I.D. approved. Designers and manufacturers of electrical-resistance up-setting and heating machines. **S.B.A.C. Stand 174.**

PERADIN AND WATERCRAFT, LTD., Freshford, nr. Bath, Somerset (Limpley Stoke 3263).—Makers of "Peratol" (aircraft cabin sealant); specialists in rubber-to-metal bondings and rubber mouldings. A.I.D., A.R.B., I.F.V. and C.I.A. approved.

RENFREW FOUNDRIES, LTD., Hillington, Glasgow (Halfway 3391).—Sand, gravity and pressure-die castings in "Alminal" aluminium alloys. **S.B.A.C. Stand 87.**

REYNOLDS TUBE CO., LTD., Tyseley, Birmingham, 11 (Acocks Green 3333).—Seamless steel tubing, straight or manipulated; welded assemblies, engine mountings and rings; manipulated aluminium tubes and solid sections; fabrication of structures incorporating aluminium alloy tubes, extrusions and sheet; aluminium-alloy pressure vessels. Manipulated stainless-steel sections. **S.B.A.C. Stand 152.**

ROBERTSON THAIN, LTD., Ellesmere Port, Wirral, Cheshire (Ellesmere Port 2341).—"Stypol" polyester resins: 14 grades ranging from heat-resistant laminating types for radome applications to flexible types to withstand extreme vibration.

ROLLET AND CO., LTD., H., 6 Chesham Place, London, S.W.1 (Sloane 3463).—Non-ferrous materials for aircraft experimental and prototype work.

RUBBAGLAS, LTD.—See under "Aircraft Parts."

SARO LAMINATED WOOD PRODUCTS, LTD., Folly Works, Whippingham, Isle of Wight (Cowes 704).—Plywood to B.S. specifications; flush doors; Medino partitioning; Sarolite roofing material: glass-reinforced laminates; plastic finishes.

SCOTT BADER AND CO., LTD., Wollaston, Wellingborough, Northants (Wollaston 262). — Manufacturers of A.I.D. and A.R.B. approved polyester resins for all types of glass-fibre laminates and mouldings.

SMITH-CLAYTON FORGE, LTD., Linco'n (Lincoln 1251).—Gas-turbine and other forgings in heat-resisting steels.

SMITH'S STAMPING WORKS (COVENTRY), LTD., Ribble Road Works, Humber Avenue, Coventry (Coventry 3151-3).—Steel drop forgings, specialists in high-temperature and alloy steels. **S.B.A.C. Stand 163.**

SOUTHERN FORGE, LTD., Meadfield Road, Langley, Bucks (Langley 301).—"Alminal" aluminium alloy bars, rods, sections, tubes, forgings and stampings. **S.B.A.C. Stand 88.**

STERLING METALS, LTD., Northey Road, Coventry (Coventry 89031).—Sand and gravity die light alloy castings in aluminium, magnesium Elektron and magnesium-zirconium alloys. **S.B.A.C. Stand 113.**

STONE AND CO. (CHARLTON), LTD., J., London, S.E.7 (Greenwich 3277). — Aircraft and aero-engine castings by sand, die and precision casting methods in aluminium, magnesium and copper-base alloys; bronze forgings. **S.B.A.C. Stand 165.**

STONE AND CO. (DEPTFORD), LTD., London, S.E.14 (Tideway 1202).—Basic metallic materials, including rivets in all non-ferrous metals. Radio and electrical equipment, including generators and automatic voltage regulators. **S.B.A.C. Stand 166.**

T.I. ALUMINIUM, LTD., Redfern Road, Tyseley, Birmingham, 11 (Acocks Green 3333).—Aircraft sheet to all B.S.S. and A.I.D. specifications; coiled strip and a wide range of extruded sections as used in leading aircraft. **S.B.A.C. Stand 119.**

TALBOT STEAD TUBE CO., LTD., Green Lane, Walsall (Walsall 4186).—Cold-drawn stainless-steel tubes and bars; bright drawn bars; machined stainless aircraft fittings; manipulated and fabricated pipework; bi-metal tubes. **S.B.A.C. Stand 75.**

TRIPLEX SAFETY GLASS CO., LTD., 1 Albemarle Street, London, W.1 (Regent 8171); King's Norton (Birmingham); and Willesden, London.—Manufacturers of safety glass and thermo-plastic materials for aircraft glazing. Products include bullet-, pressure- and bird-resistant glasses and heated glasses for de-icing. **S.B.A.C. Stand 83.**

TUBES, LTD., Aston, Birmingham (Aston Cross 3030).—Tubular forgings for jet-engine compressor and turbine shafts; contra-rotating airscrew shafts, variable-pitch airscrew parts, cylinder liners, and other components. **S.B.A.C. Stand 29.**

TUFNOL, LTD.—See under "Aircraft Parts."

TUNGUM CO., LTD., THE, Brandon House, Painswick Road, Cheltenham (Cheltenham 5856).—"Tungum" tubes, rod, bar, sheet, strip, wire, wire ropes, gauze. Tube fabrication. Machining to A.I.D. requirements. **S.B.A.C. Stand 130.**

UNITED STEEL COMPANIES, LTD., Westbourne Road, Sheffield, 10 (Sheffield 60081).—Forgings, steel plates, alloy and special steels; steel strip and wire.

VANE AND CO., A. H., Empire House, St. Martins-le-Grand, London, E.C.1 (Metropolitan 9201-2).—A.I.D. and A.R.B. approved textile fabrics, tapes, webbings, cordage, sewing threads, etc.

WALLINGTON WESTON AND CO., LTD., Frome, Somerset (Frome 2206/7/8).—Manufacturers and suppliers of thermosetting and thermoplastic plastics, synthetic and natural rubber mouldings, seals, etc.; non-flam sponge rubber and upholstery sheeting. A.I.D. and A.R.B. approved. **S.B.A.C. Stand 141.**

WARERITE, LTD.—See under "Cabin Equipment."

WELLWORTHY, LTD.—See under "Aircraft Parts."

WIGGIN AND CO., LTD., HENRY, Wiggin Street, Birmingham 16 (Edgbaston 2245).—Wrought nickel alloys in all engineering forms. Producers of the Nimonic series of alloys, standard for blades of all British turbines. **S.B.A.C. Stand 219.**

WOODS, SONS AND CO., 6 Milk Street, London, E.C.2 (Monarch 0488).—Aero fabrics, tapes, cords, threads, cables. A.I.D. and A.R.B.

YORKSHIRE COPPER WORKS, LTD., Leeds (Leeds 75431).—Solid drawn tubes in copper, brass, cupro-nickel, aluminium-brass and other special non-ferrous alloys; capillary fittings; oil and petrol pipes.

YORKSHIRE ENGINEERING SUPPLIES, LTD., Leeds, 12 (Leeds 38234 and 38291).—Manufacturers of high-grade phosphor bronze and gunmetal castings and bars, and finished machine parts. Bushes and plain bearings.

THE AIRCRAFT INDUSTRY . . .

AIRCRAFT PARTS

(Including Airframe and Engine Components and Accessories; Precision Engineering; Presswork; A.G.S. Parts.)

A.B.C. MOTORS, LTD., Walton-on-Thames, Surrey (Walton-on-Thames 774/775).—Aeronautical and precision engineers. Designers and manufacturers of airborne auxiliaries, generating and pumping units.

A.V.A., LTD., 45-47, York Street, Twickenham, Middlesex (Popesgrove 7931).—A.I.D. and A.R.B. approved. Anti-vibration mountings and shock-absorbers for instrument panels, engines, etc. Speciality mountings resistant to extremes of temperature.

ABBEY PANEL AND SHEET METAL CO., LTD., Old Church Road, Little Heath, Coventry (Coventry 88217). — Intricately-shaped metal fabrications; brazing, welding and light presswork; prototype work. A.I.D. approved.

ACCLES AND POLLOCK, LTD. —See under "Materials."

ACORN SPRING WORKS, LTD., 98 Villiers Road, London, N.W.2 (Willesden 1095).—Precision springs; helical tension, torsion and compression; wire shapes; flat springs and presswork. A.I.D. approved.

ACTON BOLT, LTD., 26 Chase Road, London N.W.10 (Elgar 5775). —Manufacturers of "Bees" bolts. Cold-headed, rolled-thread aircraft and commercial bolts; steel and brass screws; self-tapping and Phillips recessed screws; nuts and bright steel parts; parts to customers' requirements. **S.B.A.C. Stand 147.**

AERO CONTROLS, LTD., Industrial Estate, Weedon Road, Northampton (Northampton 32276-7).—Aircraft, flying, engine and locking controls; gearboxes, universal joints, control bearings, push-pull torque controls; prefabricated servicing equipment. Fasteners: screw and toggle types and Martin lock nuts. **S.B.A.C. Stand 133.**

AEROLEX, LTD., Camberley, Surrey (Camberley 1500).—Precision engineers, aircraft-component manufacturers and toolmakers; quick-release lashing equipment, safety-belts, etc.

AEROPLASTICS, LTD., Earl Haig Road, Hillington, Glasgow (Halfway 1683).—Moulded plastic components. **S.B.A.C. Stand 170.**

AIRCRAFT MATERIALS, LTD., 103 Midland Road, London, N.W.1 (Euston 6151).—"Pop" rivets, "Pop" riveting equipment; parachute quick-release mechanisms and fittings, pipe couplings, seals; bolts, nuts, washers, shackles, turnbuckles, rivets, electrical parts, fabrics, cable ducting; metals to all approved specifications. **S.B.A.C. Stand 84.**

AIRMED, LTD.—See under "Military Aircraft Special Equipment."

AIRSCREW CO. AND JICWOOD, LTD.—See under "Factory and Airfield Equipment."

AIR SERVICE TRAINING, LTD., Hamble, Southampton (Hamble 2181).—Aircraft Division: Gas-turbine installations, towed targets, aircraft repairs, component manufacture and ground equipment (See also under "Miscellaneous.") **S.B.A.C. Stand O.**

AIRSPEED (LONDON), LTD.—See under "Miscellaneous."

AIRTECH, LTD.—See under "Miscellaneous."

AMAL, LTD., Witton, Birmingham, 6 (Birchfields 4571).—Manufacturers of flame-traps, flowmeters, jet calibrators, fuel filters, non-return and pressure-regulating valves, cowling fasteners, ball and roller joints; machined assemblies, etc., to manufacturers' specification. **S.B.A.C. Stand 131.**

ANGUS AND CO., LTD., GEORGE, Oil Seal Division, Newcastle upon Tyne, 6 (Newcastle 56161).—Angus oil and fluid seals; Gaco M.I. oil seals for rotating shafts; Gaco hydraulic packings; diaphragms, gaskets, valve seats, etc.

ANTICOUSTIC CO.—See under "Miscellaneous."

ASHDOWNS, LTD., Eccleston Works, St. Helens, Lancs (St. Helens 3206).—Fibreglass reinforced laminates and tubes incorporating various resins; copper-clad laminates; Perspex and P.V.C. fabrications; paper and cotton-cloth laminates; plastic mouldings. **S.B.A.C. Stand 136.**

ASTON AND CO., LTD., E. S., 5 Sebastian Street, London, E.C.1 (Clerkenwell 2179).—Machinists of laminated plastics, cast resin, fibre, ebonite, etc. A.I.D. and A.R.B. approved.

ATTEWELL AND SONS, LTD., B., Reflection Works, Southall, Middx. (Southall 2888, 3555).—Laminated aluminium and brass sheets; shims and washers; press tools. Perspex tableware for use in aircraft. **S.B.A.C. Stand 85.**

AUTOMOTIVE PRODUCTS CO., LTD., Leamington Spa (Leamington Spa 2700).—Purolator "Micronic" and metal-element filters for oil, fuel, air and hydraulic systems. Lockheed-Avery hoses and self-sealing couplings. **S.B.A.C. Stand 34.**

AUTOSET (PRODUCTION), LTD.—See under "Factory and Airfield Equipment."

AVIATION DEVELOPMENTS, LTD.—See under "Factory and Airfield Equipment."

AVICA EQUIPMENT, LTD., 1 Adams Place, George Road, Holloway, London, N.7 (North 4281).—Stainless-steel and synthetic-rubber flexible-pipe assemblies for aircraft, rocket and guided-weapon installations. Support clamps for pipe and cable runs. Thermocouple and low-tension and high-energy ignition harnesses. **S.B.A.C. Stand 187.**

AVIMO OF TAUNTON, Taunton, Somerset (Taunton 3634).—Pressure-heads, pipe couplings, oxygen regulators, cameras, cathode-ray recording equipment, etc.

BAXTERS (BOLTS, SCREWS, RIVETS), LTD., Sheepcote Street, Birmingham, 15 (Midland 0105).—Precision rivets for flush riveting.

BELL'S ASBESTOS AND ENGINEERING, LTD., Bestobell Works, Slough, Bucks (Slough 25151).—Air-conditioning and de-icing components, Silastic products, jointings, fire seals, moulded sleeves, insulation; pressure trolley hose and asbestos-insulated concertina air-conditioning hose. **S.B.A.C. Stand 221.**

BENTON AND STONE, LTD., Aston Brook Street, Birmingham, 6 (Aston Cross 1905).—Air cylinders, control valves, etc., lubricating systems, fuel cocks and filters, oil cans, disinfectant sprayers, A.G.S. fittings.

BIRMINGHAM ALUMINIUM CASTING (1903) CO., LTD., Birmid Works, Smethwick, Birmingham (Smethwick 1431).—Light-alloy and zinc-base castings for the aircraft industry. **S.B.A.C. Stand 161.**

BLOCTUBE CONTROLS, LTD., Bicester Road, Aylesbury, Buckinghamshire (Aylesbury 828-830).—Mechanical remote controls, control pedestals, **S.B.A.C. Stand 112.**

BOLTON AND SONS, LTD., THOMAS, Mersey Copper Works, Widnes, Lancashire (Widnes 2022). Machined forgings and components in copper-bearing alloys; bearings, housings, bushes, liners, sleeves, cylinder-head inserts, and other engine and airframe details.

BOORN AND CO., LTD., THOMAS, Venn Street, Clapham, London, S.W.4 (Macaulay 3060).—Fuel hose and fuel-hose assemblies, flylite series hoses, lightweight and fire resisting. Flylink couplings and elbows. Flyclamp all-metal flanged couplings. **S.B.A.C. Stand 48.**

BONNELLA AND SON, LTD., D. H.—See under "Electrical."

BOULTON PAUL AIRCRAFT, LTD., Wolverhampton (Fordhouses 3191).—Designers and manufacturers of aircraft and armament, powered controls, hydraulic equipment and electronic research and test instruments. See also in "Proprietary Equipment" section preceding this directory. **S.B.A.C. Stand I.**

BOWDEN (ENGINEERS), LTD., Willesden Junction, London, N.W.10 (Elgar 4805).—High- and low-pressure hose units with swaged and detachable, re-usable end fittings. Wire mechanism control assemblies with swaged end fittings. Cables, conduits and control levers. **S.B.A.C. Stand 208.**

BRITISH BELTING AND ASBESTOS, LTD.—See under "Materials."

BRITISH EMULSIFIERS, LTD. —See Williamson and Co., Ltd., W. and A., in this section.

BRITISH ERMETO CORPORATION, LTD., Beacon Works, Hargrave Road, Maidenhead (Maidenhead 2271).—High-pressure pipe couplings and valves. **S.B.A.C. Stand 123.**

BRITISH, FOREIGN AND COLONIAL AUTOMATIC LIGHT CONTROLLING CO., LTD.—See under "Military Aircraft Special Equipment."

BRITISH MESSIER, LTD., Cheltenham Road, Gloucester (Churchdown 3281).—Aircraft landing gear, wheels, brakes and hydraulic equipment. (See also under "Proprietary Equipment" review preceding this directory.) **S.B.A.C. Stand 57.**

Typical Avica stainless-steel flexible piping.

BRITISH TIMKEN, LTD., Cheston Road, Aston, Birmingham, 7 (East 1321/8) — Timken tapered roller bearings for aircraft, including special types for v.p. airscrews and for helicopters, landing wheels and controls.

BRITISH WIRE PRODUCTS, LTD., Worcester Road, Stourport-on-Severn, Worcs (Stourport 240).—Cable controls and fittings; slings; launching bridles; tubes and tube bending. **S.B.A.C. Stand 197.**

BROOKS (AUTOS) LTD., T. J., Beech Street, Leicester (Leicester 60987).—Aircraft bolts, screws, nuts, studs and A.G.S. parts in mild, high-tensile and stainless steels and light alloys. Cadmium plating; prepackaging. A.I.D. and A.R.B. approved.

BROWN AND CO., LTD., E. G.—West Road, Tottenham, London, N.17 (Tottenham 2257).—Fuel and oil tanks, pilot's seats, cowlings, pressings and stampings in light sheet metal.

BROWN AND SONS (HUDDERSFIELD), LTD., DAVID, Park Works, Huddersfield, Yorkshire (Huddersfield 3500). — High-tensile steel castings for airframes; heat-resisting centrifugal castings for gas turbines; bronze castings; aircraft gears; gear-cutting tools; reamers. **S.B.A.C. Stand 178.**

BROWN BAYLEY STEELS, LTD. —See under "Materials."

BROWN BROTHERS (AIRCRAFT), LTD., Houghton Road, Northampton (Northampton 4940). —A.G.S., B.S.S. and S.B.A. standard parts; Oddie stiffnuts; B.B.A.-Rotheswan Aerojacks; aerodrome equipment; aircraft metals. **S.B.A.C. Stand 91**

BRUNTONS (MUSSELBURGH), LTD., Musselburgh, Scotland.—Aircraft cables, cable assemblies, streamline wires, tie rods, whip aerials, aerofoil blading, cold-rolled strip, fatigue-testing machines, stainless-steel wire. **S.B.A.C. Stand 67.**

BURGESS PRODUCTS CO., LTD. —See under "Factory and Airfield Equipment."

BURNLEY AIRCRAFT PRODUCTS, LTD., Burnley, Lancs (Burnley 3121.) — Specialists in development work and manufacture of jet combustion units; repair contracts for jet-pipes, flame tubes, exhaust units and discharge nozzles.

CHELTON (ELECTROSTATICS), LTD.—See under "Electrical."

CLAYTON - WRIGHT, LTD., HOWARD. Wellesbourne, Warwick (Wellesbourne 316/7/8. — A.I.D. approved. Flexible bearings; anti-vibro mounts; flexible - pipe unions; rubberised pipe clips; self-sealing weather strips; kompolastic joints or gaskets; "O" rings, etc.

COMOY AND CO., LTD., H., 90-92, Pentonville Road, London, N.1 (Terminus 1089).—Machinists and fabricators of laminated plastic components; laminated plastic instrument and control panels; moulded aircraft components. A.I.D. and A.R.B. approved.

COOPERS MECHANICAL JOINTS, LTD., Liverpool Road, Trading Estate, Slough, Bucks (Slough 24511).—Oil, petrol and air filters; intake screens; gauze strainers and breathers; gaskets; joints and washers for all applications. A.I.D. approved cork sheet, brass, steel and laminated brass shims. **S.B.A.C. Stand 220.**

CORNERCROFT, LTD., Ace Works, Coventry (Coventry 64123). —Aircraft components and assemblies, sheet metal work, assembly fixtures, jigs, tools, pressings, prototype and experimental work, precision machine work.

CROSS MANUFACTURING CO. (1938), LTD., 33, Midford Road, Combe Down, Bath (Combe Down 2355).—Engine and machine development, labyrinth seals, spring washers to B.S.S. SP.47, wire thread inserts, circlips.

CURRAN, LTD., JOHN. — See under "Factory and Airfield Equipment."

DANCER AND HEARNE BROS., LTD., Aircraft Division, Lindsay Avenue, High Wycombe (High Wycombe 1242).—Repair and manufacture of airframe structures. Jig and tool makers. Producers of compressed and densified timber.

DART AIRCRAFT, LTD., The Market Place, Chalfont St. Peter, Bucks (Gerrards Cross 3881).—Light-aircraft constructors; components in wood and metal; sheet-metal work; tubular structures, welding, plastics.

DE HAVILLAND PROPELLERS, LTD., Lostock, Bolton, Lancs (Horwich 480).—See under "Proprietary Equipment" section preceding this review.

DELANEY GALLAY, LTD., London, N.W.2 (Gladstone 2201).—Design, test, manufacture of oil coolers, radiators, cabin heaters, wing de-icers, fuel tanks, etc. Components for jet aircraft and guided missiles; research and development. (See also in "Proprietary Equipment" review preceding this directory.) **S.B.A.C. Stand 162.**

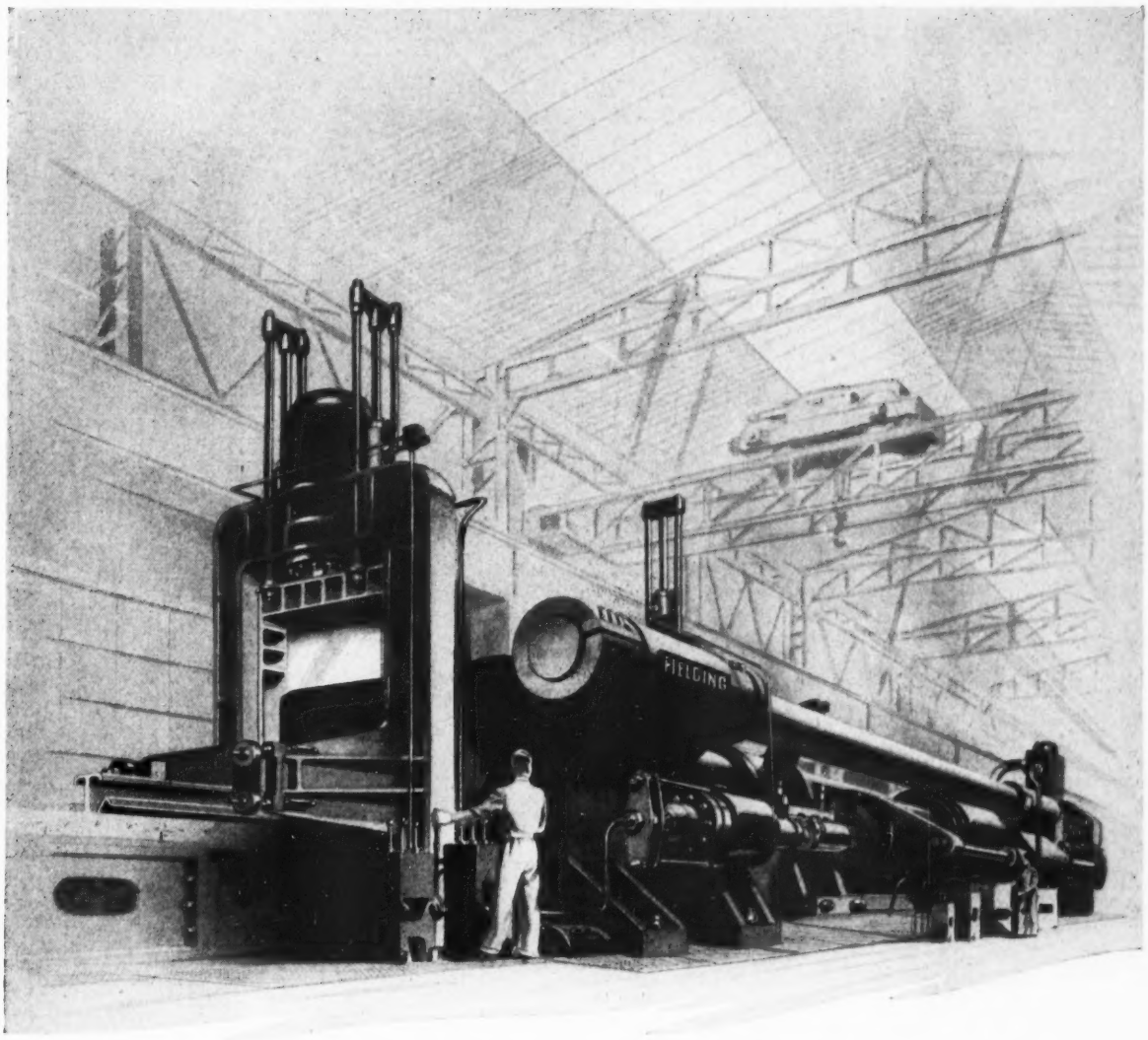
DOWSING CO. (ELECTRICAL MANUFACTURERS), LTD., Kangley Bridge Road, Lower Sydenham, London, S.E.26 (Sydenham 7016).—Light engineering aircraft parts.

DOWTY EQUIPMENT, LTD., Cheltenham, Glos. (Cheltenham 53471).—Designers and manufacturers of aircraft undercarriages, hydraulic and electrical equipment. (See also under "Proprietary Equipment" section preceding this directory). **S.B.A.C. Stand 205.**

DOWTY EQUIPMENT OF CANADA, LTD., Ajax, Ontario, Canada.—Manufacturers of aircraft undercarriages, hydraulic and electrical equipment. **S.B.A.C. Stand 207.**

DOWTY FUEL SYSTEMS, LTD., Cheltenham, Glos. (Cheltenham 53471).—Designers and manufacturers of pumps, spill burners and fuel systems for gas turbines.

DOWTY SEALS, LTD., Ashchurch, Glos. (Tewkesbury 2271).—Designers and manufacturers of



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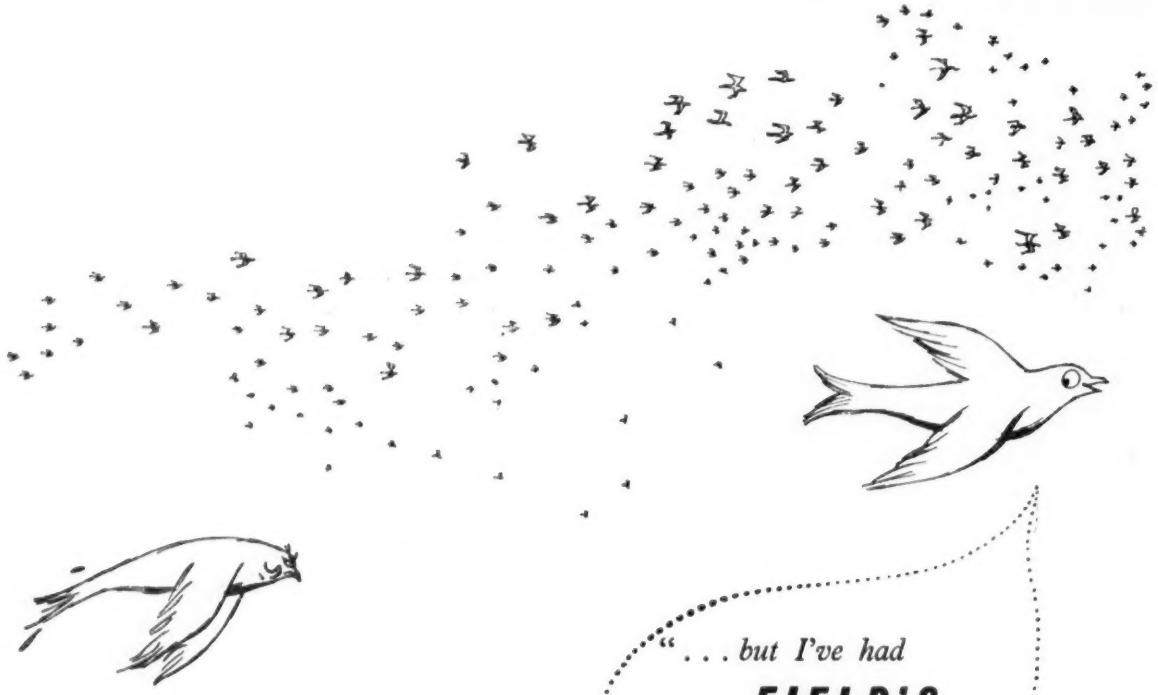

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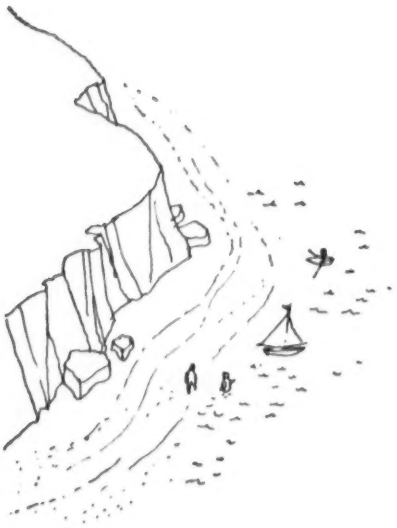
Comprehensive Service"



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THE AIRCRAFT INDUSTRY . . .

Aircraft Parts (continued)

rubber and synthetic rubber seals and mouldings of all types. **S.B.A.C. Stand 206.**

DUNLOP RUBBER CO., LTD. (Aviation Division), Coventry (Coventry 88733).—Tyres, wheels, brakes, pneumatic and hydraulic operating equipment; windscreen wipers; de-icing equipment; compressors, flexible pipes and rubber accessories. **S.B.A.C. Stand 154.**

DZUS FASTENER EUROPE, LTD., Farnham Factory Estate, Farnham, Surrey (Farnham 4422).—Dzus fasteners; panel mounting, supersonic self-ejecting and standard types in various types and sizes. **S.B.A.C. Stand 209.**

ELECTRO-HYDRAULICS LTD., Liverpool Road, Warrington, Lancashire (Warrington 2244).—Landing gear, hydraulic systems and components; electro-hydraulic and fuel valves, powered flying controls. (See also in "Proprietary Equipment" review preceding this directory. **S.B.A.C. Stand 76.**

Oddie stiffnut—Brown Bros. (Aircraft), Ltd.

ELLIOTT BROS. (LONDON) LTD.—See under "Aircraft Instruments."

ENGLISH NUMBERING MACHINES, LTD. — See under "Factory and Airfield Equipment."

E.N.V. ENGINEERING CO., LTD., Hythe Road, Willesden, London, N.W.10 (Ladbroke 3622).—Straight-tooth, spiral and hypoid gears; spur and helical gears. Precision curved-tooth and spur gears for high-speed applications. A.I.D. approved. **S.B.A.C. Stand 37.**

EQUATOR WHEELS AND SECTIONS, LTD., Raglan Street, Wolverhampton (Wolverhampton 21605/6).—Manufacturers of stainless-steel stiffening bands for jet engines; cold rolling; forming and coiling in all metals; manipulators of profiles.

ESSEX AERO, LTD., The Airport, Gravesend, Kent (Gravesend 4261).—Specialists in magnesium fabrications, including oil and fuel tanks, door and window frames. Castings, pressings, forgings in light or ultra-light alloys. **S.B.A.C. Stand 203.**

EVERSHED AND VIGNOLES, LTD., Acton Lane Works, Chiswick, London, W.4 (Chiswick 3670).—Position-controllers for engine throttle, flap and airscrew-pitch control; "Megger" insulation testers; "Megger" bond testers; servo motors.

EXACTOR, LTD., 108 Park Street, London, W.1 (Mayfair 0252-4), and Exactor Works, Edgware, Middlesex.—Hydraulic components; self-sealing couplings, inc. refuelling connections and drop-tank breakaway couplings; self-drain filters for factory compressed-air lines; centralized lubricating systems for machinery. **S.B.A.C. Stand 94.**

FAILSWORTH PLASTICS, Claremont Street, Failsworth, Lancs (Proprietors, Failsworth Hats, Ltd.).—A.I.D. approved for flexible aircraft components made from P.V.C.-covered felt; resistant to oil, petrol, glycol, water and heat.

FAIREY AVIATION CO., LTD., Hayes, Middlesex (Hayes 3800).—Plastic components, powered controls; S.B.A.C. standards. (See also under "Aircraft" section.)

FAIRTHORPE, LTD., The Market Place, Chalfont St. Peter, Bucks (Gerrards Cross 3881).—Airframe, engine and airscrew components; all types of machining, including particularly special development work, jig fixtures, form-tools, cutting tools; servicing.

FEENY AND JOHNSON, LTD., 134-136 Ealing Road, Wembley, Middlesex (Wembley 4801/2).—High-pressure instantly detachable couplings, including 12,000 lb/sq in type for jet starting; trailer vacuum brakes; Universal clips, 5/16 in to 30 ft diam.; air-control conversion units for disabled-driver vehicles.

FENNER AND CO., LTD., J. H., Marfleet, Hull, Yorkshire (Central 33802).—Manufacturers of V-belts, taper-lock pulleys, V-pulleys; "Hainsworth" variable-speed pulleys; solid woven and leather transmission belting; mechanical rubber products.

FERODO, LTD.—See under "Materials."

FERRO ENAMELS, LTD.—See under "Paints and Finishes."

FIREPROOF TANKS, LTD., The Airport, Portsmouth (Portsmouth 70836-7-8).—Manufacturers of flexible fuel-tanks; crash-resistant, flame-proof and self-sealing coverings for flexible and rigid tanks; moulded rubber components for numerous applications. **S.B.A.C. Stand 20.**

FIRESTONE TYRE AND RUBBER CO., LTD., Great West Road, Brentford, Middlesex (Ealing 3456).—Pneumatic tyres and inner tubes for aircraft and for airfield transport. Rubber-to-metal bonded parts, including engine mountings and vibration dampers. **S.B.A.C. Stand 21.**

FISCHER BEARINGS CO., LTD., Wolverhampton (Wolverhampton 26101).—Ball and parallel-roller bearings, miniature bearings; specialists in the manufacture of precision bearings for jet and piston engines.

FLEXIBOX, LTD., Nash Road, Trafford Park, Manchester 17 (Trafford Park 2651).—Mechanical seals for centrifugal and displacement pumps, and for rotary and oscillating shafts and pipes, in all types of fuel, hydraulic and de-icing systems. A.I.D. approved.

FLEXO PLYWOOD INDUSTRIES, LTD.—See under "Materials."

FLIGHT REFUELLING, LTD.—See under "Fuels and Lubricants."

FOLLAND AIRCRAFT, LTD., Hamble, Hants (Hamble 3191).—Design and construction of aircraft; component production; experimental work.

GARRINGTONS, LTD., Bromsgrove, Worcs (Bromsgrove (2621).—Aircraft forgings. Forged blades for gas turbines and compressors, experimental or mass-production, to oversize or precision limits (alternatively, fully machined) in light alloys, aluminium bronzes, stainless steels and nickel or titanium alloys.

GENERAL ELECTRIC CO., LTD.—See under "Factory and Airfield Equipment."

GIRLING, LTD., Kings Road, Tyseley, Birmingham (Acocks Green 2831).—Hydraulic self-adjusting brakes for light and medium aircraft; hydraulic master cylinders with integral reservoirs: hydraulic reservoirs for aerobatic flying; hand control units. **S.B.A.C. Stand 92.**

GODFREY AND PARTNERS, LTD., SIR GEORGE, Hampton Road West, Hanworth, Middlesex (Feltham 3291).—Pressurization and air-conditioning equipment, air turbo-drives, ground servicing trolleys. (See also in "Proprietary Equipment" review preceding this directory.) **S.B.A.C. Stand 93.**

GOODYEAR TYRE AND RUBBER CO. (GT. BRITAIN), LTD., Aviation Division, Bushbury, Wolverhampton (Wolverhampton 22301) and Wallasey, Cheshire.—Aircraft tyres, wheels, brakes and associated equipment. Automatic braking. Disc brakes for civil and military aircraft, and cross-wind castoring wheels. (See also in "Proprietary Equipment" review preceding this directory.) **S.B.A.C. Stand 58.**

GOSHERON AND CO., LTD., JOHN, Gayford Road, London, W.12 (Shepherds Bush 3326).—Self-adhesive tapes for sealing, identifying, fastening, warning and instructing, conforming to all A.I.D., M.O.S., and Admiralty current specifications. Tropicalization tapes.

GUEST KEEN AND NETTLEFOLDS (MIDLANDS), LTD., Birmingham, 18 (Smethwick 1441).—Wood screws in steel, brass, copper, stainless steel and aluminium alloy; self-tapping screws; cotter pins, drive screws, screwnails; aircraft bolts, nuts and rivets; "Aerotight" stiffnuts; Phillips recess-head screws and bolts; "Sems" fastener units. **S.B.A.C. Stand 103.**

HADLEY CO., LTD., Portsmouth Road, Surbiton, Surrey (Emberbrook 2710).—Moulders and fabricators of components in plastics and metal; safety goggles and face-masks.

HARDY, SPICER, LTD., Birch Road, Witton, Birmingham, 6 (Birchfields 4504).—Needle roller universal joints and drive; shafts for main and auxiliary drives; standard angle and special applications.

HEADLAND, LTD., THOS. P., 164/8 Westminster Bridge Road, London, S.E.1 (Waterloo 5600).—Dzus fasteners, aircraft components, general engineering supplies, garage equipment, torsion wrenches, aircraft and alloy steels.

HELLERMANN, LTD., Tinsley Lane, Crawley, Sussex (Crawley 747).—Hellermann cable binding and marking system; "Helvin" aircraft pressure bungs; P.V.C. mouldings, dippings and extrusions; "P" clips. **S.B.A.C. Stand 190.**

HELLIWELLS, LTD., The Airport, Walsall, Staffs (Walsall 4553).—Aircraft component and sheet-metal work; aircraft overhauls and repairs. **S.B.A.C. Stand 116.**

HESTON AIRCRAFT CO., LTD., Heston Airport, Hounslow, Middlesex (Southall 2321-9).—Design and construction of experimental aircraft; aircraft components, specialized ground equipment, including aircraft maintenance docks and adjustable passenger steps. Light-alloy fabrications.

HIGH DUTY ALLOYS, LTD.—See under "Materials."

HIGH PRESSURE COMPONENTS, LTD., 139, Kensington High Street, London, W.8 (Western 3617).—Gyp metal pipe joints (flared and flareless); plastic pipe joints; reusable hose-end fittings; hose assemblies; non-return valves.

HOBSON, LTD., H. M., Hobson Works, Fordhouses, Wolverhampton (Fordhouses 2266).—Injection and float-type carburetters, engine (cockpit) controls, flap synchronizing controls, hydraulic flying controls, hydraulic screwjack actuators, irreversible hydraulic jacks, fuel-injection pumps, gas-turbine accessories. See also in "Proprietary Equipment" review preceding this directory. **S.B.A.C. Stand 98.**

HOFFMAN MANUFACTURING CO., LTD., Chelmsford, Essex (Chelmsford 3151).—Makers of ball and roller bearings for all types of power units, controls, rudder posts, landing wheels, aircraft carrier lifts and catapult gear.

HORDERN-RICHMOND, LTD.—See under "Materials."

HYMATIC ENGINEERING CO., LTD., Redditch, Worcs (Redditch 743).—High- and low-pressure pneumatic equipment; compressors, valves, actuators, pneumatic guns, fuel-system and seal pressurization valves, test rigs. **S.B.A.C. Stand 38.**

I.V. PRESSURE CONTROLLERS, LTD., Forge Works, 844 Bath Road, Cranford, Middlesex (Hayes 2809 and 1203).—High- and low-pressure equipment manufacturers. Reducing valves; solenoid valves; relief valves; Admiralty-type high-pressure stop valves; air starting equipment; hot gas valves and acid valves.

IMPERIAL CHEMICAL INDUSTRIES, LTD. (Plastics Division), Black Fan Road, Welwyn Garden City, Herts (Grosvenor 4010).—Aircraft components and accessories in "Perspex" acrylic sheet, "Fluon" (polytetrafluoroethylene) and nylon; "Darvic" (rigid p.v.c. sheet) and p.v.c.-coated leathercloth. **S.B.A.C. Stand 36.**

INGERSOLL (MANUFACTURING), LTD., South Ruislip, Middlesex (Byron 3456).—Toggle fasteners, locking devices and release slips for all purposes. Clockwork, time-based and allied instruments.

INTEGRAL, LTD., Birmingham Road, Wolverhampton (Wolverhampton 24984).—Aircraft hydraulic equipment, pumps, motors, control valves, and high-precision mechanisms. (See also under "Proprietary Equipment" section preceding this directory.) **S.B.A.C. Stand 97.**

JABLO PROPELLERS, LTD.—See under "Materials."

K.L.G. SPARKING PLUGS, LTD.—See under "Electrical."

KAUTEX, LTD., Elstree Way, Elstree, Herts (Elstree 1777).—Jointings in synthetic-rubber-bonded cork to spec. D.T.D. 762. Rubber and synthetic rubber mouldings.

KENT ALLOYS, LTD.—See under "Materials."

KING AIRCRAFT CORPORATION, Hillington, Glasgow (Halfway 4571). — Flush-fitting toggle fasteners; all-metal flexible fireproof couplings; drain valves; filters; arctic panel latch; filler caps; shear-type button fasteners; S.B.A.C. standard parts. **S.B.A.C. Stand 62.**

KLINGER, LTD., RICHARD, Klingerit Works, Sidcup, Kent (Foots Cray 3022). — "Klingerit" jointing (compressed asbestos sheeting) for ready-cut gaskets and washers. Silicone rubber (extrusions, mouldings and sheeting) for extreme-temperature applications of gaskets, washers and seals.

LANCEFIELD AIRCRAFT COMPONENTS, LTD., Wrenfield Place, Herries Street, London, W.10 (Ladbroke 2951).—Passenger and pilot seats; exhaust manifolds, shrouds; tube manipulation; radar waveguides; protective covers; safety harnesses; engine cowlings and sheet-metal work. **S.B.A.C. Stand 176.**

LEYTONSTONE JIG AND TOOL CO., LTD.—See under "Factory and Airfield Equipment."

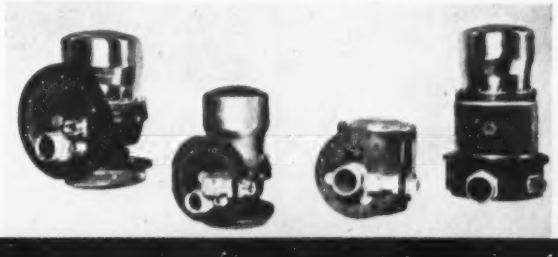
LINREAD, LTD., Cox Street, Birmingham, 3 (Central 3951).—High-tensile aircraft bolts: hexagon slotted and Phillips recessed. Aircraft screws: slotted and Phillips recessed. Aircraft rivets: special cold forgings; light presswork.

LOCKHEED HYDRAULIC BRAKE CO., LTD., Leamington Spa (Leamington Spa 2700).—Complete hydraulic systems for aircraft; Mk 8 engine-driven pump; undercarriages and retracting gear; "Servodyne" power-assisted flying controls; hydraulic brake assemblies for turbojets. (See also under "Proprietary Equipment" review preceding this directory.) **S.B.A.C. Stand 35.**

LONDEX, LTD.—See under "Electrical."

LUCAS (GAS TURBINE) EQUIPMENT), LTD., JOSEPH, Birmingham, 28 (Springfield 3232).—Research, design, development and manufacture of fuel pumps and systems, hydraulic control systems, combustion equipment, and de-icing heaters. (See also in "Proprietary Equipment" review preceding this directory.) **S.B.A.C. Stand 157.**

New fuel pumps by the Pulsometer Engineering Co. Ltd.



THE AIRCRAFT INDUSTRY . . .

Aircraft Parts (continued)

M.H.H. ENGINEERING CO., LTD.—See under "Electrical."

M.L. AVIATION CO., LTD.—See under "Military Aircraft Special Equipment."

MAGNESIUM ELEKTRON, LTD.—See under "Materials."

MARSTON EXCELSIOR, LTD. (Imperial Chemical Industries, Ltd.), Wobaston Road, Fordhouses, Wolverhampton (Fordhouses 2181).—"Flexelite" flexible tanks for fuel and other applications; light-alloy heat-exchange equipment; sheet-metal fabrication and machined components; radomes, fin tips, aerial housings and ducting, etc., in reinforced plastic laminates. **S.B.A.C. Stand 120.**

METALASTIK, LTD., Evington Valley Road, Leicester (Leicester 37281/2/3/4).—Anti-vibration mountings and devices; flexible mountings for engines, instruments and other components; flexible couplings.

METAL COMPONENTS, LTD., Dolphin Road, Shoreham-by-Sea, Sussex (Shoreham-by-Sea 2224/5).—A.I.D. and A.R.B. approved aircraft plugs and sockets; A.G.S. parts; light metal and fibre pressings; precision machining and small electrical mechanical assemblies.

MIDLAND AEROQUIPMENT, LTD., Bloxwich, Staffs (Bloxwich 66414).—Door locks and fastenings.

MILES, LTD., F. G. (Plastics Division), Shoreham Airport, Sussex (Shoreham-by-Sea 2301).—Structural plastics engineers; development and production of moulded plastics radar aerials, radomes and aircraft components.

MILES, LTD., F. G., Shoreham Airport, Sussex (Shoreham-by-Sea 2301).—Designers and constructors of prototype aircraft; manufacturers of jigs, tools, components and sub-assemblies; designers and manufacturers of optical inspection equipment.

MOLLART ENGINEERING CO., LTD., Kingston By-Pass, Surbiton, Surrey (Elmbridge 3352).—M.E. patent and Hooke's type universal joints; precision-machined aircraft components; horizontal and vertical comparators; Medigraph perspective drawing instrument. **S.B.A.C. Stand 228.**

MOUNTFORD (BIRMINGHAM), LTD., FREDK., Fremo Works, Moseley Street, Birmingham, 5 (Midland 3488/9).—Aircraft taper pins (solid and split), stainless-steel bolts, screws, nuts, etc., special repetition components.

NEWMAN INDUSTRIES, LTD.—See under "Electrical."

NORGREN, LTD., C. A.—See under "Factory and Airfield Equipment."

NORMALAIR, LTD.—See under "Cabin Equipment."

ODDIE, BRADBURY AND CULL, LTD., Portswood Road, Southampton (Southampton 55883).—Oddie (quick-release) fasteners for aircraft, general and special purpose. A.I.D. and A.R.B. approved.

OMES LTD.—See under "Materials."

OPPERMAN, LTD., S.E., Stirling Corner, Boreham Wood, Herts (Elstree 2021).—Gears, gear boxes and components for aircraft and engines.

PALMER TYRE, LTD., THE, Herga House, Vincent Square, London, S.W.1 (Victoria 8323).—Aircraft and helicopter tyres, wheels and brakes, Silvoflex high-pressure hose for hydraulic controls and high-pressure fuel systems. Actuators; rudder-bar differential brake-control assemblies; helicopter pontoons; inspection hole covers, etc. **S.B.A.C. Stand 107.**

PERADIN AND WATERCRAFT, LTD.—See under "Materials."

PHILIDAS, LTD., (Division of Whitehouse Industries, Ltd.), Great North Road, Ferrybridge, Yorks (Knottingley 320).—Manufacturers of the Philidas self-locking nut, fully approved by A.I.D. and A.R.B. **S.B.A.C. Stand 191.**

PIONEER OILSEALING AND MOULDING CO., LTD., Cottontree Works, Colne, Lancashire (Wycoller 411/2).—Manufacturers of every type of synthetic rubber O-ring and oil-seal. A.I.D. and A.R.B. approved.

PLESSEY GROUP OF COMPANIES, LTD., Ilford, Essex (Ilford 3040).—Radio communications equipment; cartridge and liquid-fuel starters; pumps, oil separators, suction regulating and relief valves; actuators; complete wiring systems and ancillaries. **S.B.A.C. Stands 14 and 15.**

POWER FLEXIBLE TUBING CO., LTD., Derby Works, Vale Road, London, N.4 (Stamford Hill 6696).—Flexible assemblies, including stainless-steel flexible metallic tubing and fittings, stainless steel bellows and expansion joints.

POWER JACKS, LTD., Valetta Road, Acton, London, W.3 (Shepherds Bush 3443/6).—Hydraulic Pumps, hand- or power-operated. Rams, extension, retracting or double acting. Hydraulic valves, for pressures up to 3,000 lb/sq in.

POWIS AND SONS, LTD., DAVID, Golden Hillock Road, Sparbrook, Birmingham, 11 (Victoria 1264/8).—A.I.D. and A.R.B. approved light alloy aircraft rivets and split cotter pins.

PRECISION RUBBERS, LTD., Bagworth, Leicestershire (Bagworth 241).—Specialists in natural and synthetic rubber components for airframes, engines, fuel and hydraulic systems, etc. A.I.D. and A.R.B. approved. **S.B.A.C. Stand 24.**

PRECISION UNITS (DORSET), LTD., 9, Fortescue Road, Bournemouth, Hants (Parkstone 1664) and Seacrest Works, Wessex Road, Parkstone, Dorset.—Machine-engraved nameplates and labels in metal, Traffolyte, Perspex, etc.

PRESSED STEEL CO., LTD., Cowley, Oxford (Oxford 77701).—Aircraft assemblies and pressings. **S.B.A.C. Stand 202.**

PULSOMETER ENGINEERING CO., LTD., Nine Elms Ironworks, Reading (Reading 67182/5).—Tank-mounted, electrically-driven fuel pumps for aircraft, A.I.D. and A.R.B. approved.

PYTRAM, LTD., Dunbar Road, New Malden, Surrey (Malden 3225).—Manufacturers of seamless heating and air-conditioning ducting in laminated cellulose fibre. Temperature range—70 deg. C to 200 deg. C. Double-curvature forcings of all types.

R.F.D. CO., LTD.—See under "Parachutes, Dinghies and Safety Equipment."

R.M.R. ENGINEERING, Brook Street, Tring, Herts (Tring 3338).—A.I.D. and A.R.B. approved. Makers and suppliers of a wide range of pipe-line unions and couplings, including rod end bearings.

RANSOME AND MARLES BEARING CO., LTD., Stanley Works, Newark-on-Trent (Newark 456-459).—Manufacturers of all types of ball and roller bearings, including special types for aircraft engines, superchargers, jet units, controls, airscrews and landing wheels.

REYNOLDS TUBE CO., LTD.—See under "Materials."

RILEY, LTD., ROBERT, Milk stone Spring Works, Rochdale (Rochdale 2237).—Springs for all aircraft purposes. Specialists in beryllium copper springs. On Admiralty, War Office and Air Ministry Lists; A.R.B. approved.

ROBINSON AND CO. (GILLINGHAM), LTD., L., London Chambers, Gillingham, Kent (Gillingham 5282).—"Jubilee" hose clips.

ROSS, COURTNEY AND CO., LTD., Ashbrook Road, London, N.19 (Archway 1166).—Terminals, tags, wire ends, repetition turned parts, presswork, aircraft general stores.

ROTAX, LTD.—See under "Electrical."

ROTHERHAM AND SONS, LTD., Coventry (Coventry 64154). A.G.S. components (pipe couplings, etc.); pressure-gauge movements; time-delay mechanisms; petrol and drain taps.

ROTOL, LTD., Cheltenham Road, Gloucester (Gloucester 24431).—Variable-pitch aircraft and marine propellers. Accessory drive and engine synchronisation equipment. (See also under "Proprietary Equipment" review preceding this directory. **S.B.A.C. Stand 56.**

RUBBAGLAS, LTD., 245, Vauxhall Bridge Road, London, S.W.1 (Victoria 6501).—"Rubbaglex" sheeting and gaskets, glass-based, chemical and fire-resistant.

RUBERY, OWEN and CO., LTD., Darlaston, South Staffs (Darlaston 130).—Aircraft standard parts; bolts and nuts to all aircraft specifications; hydraulic jacks and valves and numerous other types of components and accessories; presswork; structural steelwork. **S.B.A.C. Stand 77.**

S.U. CARBURETTER CO., LTD., Erdington, Birmingham (Erdington 2150).—Piston-engine fuel-injection pumps and associated equipment. A.I.D. and A.R.B. design approval.

ST. HELENS CABLE AND RUBBER CO., LTD., SLOUGH, BUCKS (Slough 20333).—Moulded, extruded and hand-made rubber mechanicals; specialists in development of prototypes for initial experiments; "Cabtyrit" linings for anti-corrosive applications. A.I.D. approved.

SALTER AND CO., LTD., GEO., West Bromwich, Staffs (West Bromwich 1331).—Springs, roller bearings, retaining rings and circlips, spring balances, grey iron castings; "Salterpak" prepackaging service.

SANKEY AND SONS, LTD., JOSEPH, Albert Street Works, Bilston, Staffs (Bilston 41161).—Complete assemblies for gas-turbine engines and airscrew spinners. Pressed, fabricated and machined components in heat-creep and corrosion-resisting materials **S.B.A.C. Stand 210.**

SARO LAMINATED WOOD PRODUCTS, LTD.—See under "Materials."

SAUNDERS VALVE CO., LTD., Cwmbran, Monmouthshire; Aircraft Division: Blackfriars Street, Hereford (Hereford 3088).—Cocks and valves for control of all aircraft fluids. Diaphragm valves for ground installations. **S.B.A.C. Stand 80.**

SELF-PRIMING PUMP AND ENGINEERING CO., LTD., Trading Estate, Slough, Bucks (Slough 23277).—Electrically and air-turbine-driven fuel booster pumps, cabin heater pumps, water/methanol injection pumps, hand-operated priming pumps, fuel recuperators, inverted flight valves, non-return valves, float valves, airflow regulator valves, etc. **S.B.A.C. Stand 69.**

SERCK RADIATORS, LTD., Warwick Road, Birmingham 11 (Victoria 0531).—Heat-exchange equipment for piston and gas turbine power plants on aircraft and land installations, and for presses and machine tools.

SETON CREAGHE ENGINEERING, LTD., Trading Estate, Park Royal, London, N.W.10 (Elgar 5257).—Prototype assemblies, mechanical and electro-mechanical.

SIEGRIST-OREL, LTD., 39 Berners Street, London, W.1 (Museum 0032).—Makers of cable-identification sleeves. Speciality: High-temperature and light-resisting neoprene markers.

SILENTBLOC, LTD., Victoria Gardens, London, W.11 (Park 9821).—Anti-vibration mountings, rubber-bonded-to-metal couplings, flexible bearings; Silentbloc Vibrex fasteners; Silentbloc-Interlock principle for riveting clamps, electrical and mechanical quick-release couplings. **S.B.A.C. Stand 173.**

SIMMONDS AEROCESSORIES, LTD., Treforest, Pontypridd, Glamorgan (Treforest 2211).—Pacitor fuel gauges, Nyloc stiffnuts, Spire fasteners. **S.B.A.C. Stand 13.**

SKEFKO BALL BEARING CO., LTD., Luton, Beds (Luton 5700).—All four basic types of rolling bearings (ball, cylindrical, tape and spherical roller), power transmission equipment, ball-bearing aircraft control pulleys and rubber tyred rollers.

SMITHS OF STOCKPORT, LTD.—See under "Factory and Airfield Equipment."

SPENCER, MOULTON AND CO., LTD., GEORGE, 13/14, Ashley Place, London, S.W.1 (Victoria 1864).—Rubber-to-metal bondings, mouldings (rubber, neoprene, Silastic), hoses, rubber springs.

STANDARD INSULATOR CO., LTD., Bridge Road, Camberley, Surrey (Camberley 1813).—Moulded rubber grommets to B.S.S. S.P.40, complete range, in addition to standard range of 500 sizes in natural and synthetic grades. Standard patent double-turn hose clips with universal application. **S.B.A.C. Stand 194.**

STARAVIA, Blackbushe Airport, Camberley, Surrey (Camberley 1600).—Ground, overhaul, and test equipment; aircraft spares and ancillaries.

STONE AND CO. (DEPTFORD), LTD.—See under "Materials."

SUNTEX SAFETY GLASS INDUSTRIES, LTD., Iver, Bucks (Iver 11/12).—Aircraft canopies, cockpit covers and all vision panels in Perspex, clear and tinted. Bird-resistant and bullet-resistant safety-glass; day/night flying training window panels. **S.A.B.C. Stand 175.**

SUPER OIL SEALS AND GASKETS, LTD., King's Norton, Birmingham (King's Norton 2041-7).—Manufacturers of oil seals, high-precision mechanical mouldings in natural and synthetic rubber, and high-pressure hose. British licensees for "Aeroquip" detachable re-usable hose-end fittings. **S.B.A.C. Stand 60.**

T.K.S. (AIRCRAFT DE-ICING), LTD., Drayton House, Gordon Street, London, W.C.1 (Euston 4650).—Research, design and manufacture of aircraft de-icing equipment. **S.B.A.C. Stand 18.**

TALBOT STEAD TUBE CO., LTD.—See under "Materials."

TECHNOGRAPH PRINTED CIRCUITS, LTD.—See under "Electrical."

TEDDINGTON CONTROLS, LTD., Merthyr Tydfil, South Wales (Merthyr 666).—Aircraft temperature- and pressure-control equipment; time and sequence switches; hot-air valves, some operating up to 700 C; electro-magnetic valves; fuel-tanking pressurization equipment. **S.B.A.C. Stand 63.**

TELEFLEX PRODUCTS, LTD., High Road, Chadwell Heath, Essex (Seven Kings 5771).—Mechanical remote-control equipment for aircraft; engine test-bed control equipment. **S.B.A.C. Stand 39.**

TENAPLAS (SALES), LTD., Upper Basildon, nr. Pangbourne, Berks (Upper Basildon 333).—Extruders of polythene tubing, mouldings, P.V.C. extruded sections, tubes, tapes, sleevings, markers.

TERRY AND SONS, LTD., HERBERT, Redditch, Worcs (Redditch 61).—Springs, presswork, flexible shafts, Anglepoise lamps, security worm-drive hose clips.

THERMAL CONTROL CO., LTD.—See under "Fire-protection Equipment."

THERMO-PLASTICS, LTD., Luton Road Works, Dunstable, Beds (Dunstable 686).—Moulders and fabricators of all plastic materials; radomes, glass fabric and asbestos laminates, canopies, hoods, etc. **S.B.A.C. Stand 200.**

THOMPSON BROS. (BILSTON), LTD.—See under "Fuels and Lubricants."

TRIST AND CO., LTD., RONALD, Bath Road, Slough, Bucks (Slough 20222).—"Seatrist" packings and seals and special-purpose rubber and synthetic-rubber products, used particularly in hydraulic systems; "Mobrey" magnetic level switches for liquid-level control on ground installations.

TUBES, LTD.—See under "Materials."

TUCKER EYELET CO., LTD., GEO., Walsall Road, Birmingham, 22B (Birchfields 5024).—"Pop" rivets; cup rivets; eyelets; tags and terminals; small metal pressings.

TUFNOL, LTD., Perry Barr, Birmingham 22B (Birchfields 4554).—Tufnol parts for aircraft, including

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in a Southern Forge extrusion press—and you can have long lengths of ALMINAL in all the specialised shapes which your product demands. Light weight combined with strength; clean-cut sections to close tolerances; always smooth, bright and attractive in appearance—all features which add considerably to the efficiency and sales appeal of your product.

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ERIC, THE VERY GENTLE KNIGHT

NOW this very gentle Knight, Eric, prepared to defend his realms against the barbarian invaders.

"What is the strength of my forces?" he asked.

"Four thousand and fifty gallant men and true," said his Chief Statistician.

"Arm them mightily to withstand every blow that the enemy may deliver . . ."

"But, sire, in all the land we have only two dozen skilled armourers. All our forges and furnaces are already at work . . ."

"Then do your best. Fashion the helmets of solid brass, make the suits of armour so strong that neither lance nor arrow will wound. Arm their steeds too with the finest and heaviest chain mail. I am a man of peace."

"But, sire, the task is far beyond our resources."

"Those who defend my realms," said the Knight Eric, "must be the most heavily accoutred in all Europe."

The Chief Statistician sighed, slowly shook his head and withdrew.

A month later the barbarians attacked and seventy-three knights rode forth to do battle, their fine armour gleaming in the sun, their plumes flying.

Eric, watching from the battlements of his castle, saw them, counted them and turned incredulously to the Chief Statistician.

"How many knights have we?" he asked.

"Seventy-three armed as you have directed, sire, and three thousand nine hundred and seventy-seven without weapons and therefore *hors de combat*."

Eric turned pale. He saw his seventy-three knights surrounded by thousands of barbarians. He saw them fall from their mounts and lie gasping like landed fish.

"Why, oh why," groaned Eric, "do they not get to their feet and fight like men?"

"Alas, sire," said the Chief Statistician, "their armour is too much for them."

As one by one the knights were slain Eric buried his face in his hands and wept.

"To think," he said, "that we might have put four thousand men and horses into the field!"

"Four thousand and fifty, sire," said the Chief Statistician.

Folland Aircraft Limited, of Hamble, Hampshire, in their programme of research, design and prototype development, take into account national resources, man power, mobility and readiness for defence.

FOLLAND

THE AIRCRAFT INDUSTRY . . .

Aircraft Parts (continued)

pulleys, fairleads, gears, bearings and electrical insulators. Also jigs and Tufnol sheets, tubes and rods. **S.B.A.C. Stand 188.**

UHLHORN BROS., LTD., 53 City Road, London, E.C.1 (Clerkenwell 0145/9).—Machinists and fabricators of aircraft components in all plastic and allied materials.

ULTRA ELECTRIC, LTD.—See under "Electrical."

VENNER, LTD.—See under "Electrical."

VICKERS-ARMSTRONGS, LTD.—See under "Cabin Equipment."

VOKES, LTD., Guildford, Surrey (Guildford 62861).—Air-intake, fuel, lubricating and hydraulic-oil filters; filters and silencers for cabin air control. Test bed filters. **S.B.A.C. Stand 99.**

WALLINGTON WESTON AND CO., LTD.—See under "Materials."

WARWICK PRODUCTION CO., LTD., Saltisford, Warwickshire (Warwick 693).—Sub-assemblies in aluminium and steel; also pressing, spinning, welding, riveting, electro-polishing, plating, anodising, etc.

WELLWORTHY, LTD., Lymington, Hants (Lymington 520).—Sealing rings for jet engines; Al-Fin bimetallic assemblies; pistons and rings; jointing compound; aluminium die castings. **S.B.A.C. Stand 126.**

WESTERN MANUFACTURING (READING), LTD., The Aerodrome, Reading, Berks (Sonning 2351).—Designers and manufacturers of electrical actuators, trim switches, limit switches, fractional h.p. motors and artificial stall-warning devices. **S.B.A.C. Stand 217.**

WESTINGHOUSE BRAKE AND SIGNAL CO., LTD.—See under "Electrical."

WESTON AND CO., LTD., CHARLES, Irwell Bank Works, Douglas Green, Pendleton, Salford. 6 (Pendleton 2857).—A.I.D. and A.R.B. approved. Weston synthetic rubber and leather seals, 'O' rings and mouldings. Impax face-type seal.

WEYBURN ENGINEERING CO., LTD., Elstead, Godalming, Surrey (Elstead 2141-2-3).—Camshafts, and precision components for aircraft.

WHITEHOUSE INDUSTRIES, LTD.—See Philidas, Ltd., in this section.

WILKINSON RUBBER LINATEX, LTD.—See under "Cabin Equipment."

WILLCOX AND CO., LTD., W. H., Aviation Section, Southwark House, Southwark Street, London, S.E.1 (Hop 8022).—Willcox universal joints, A.I.D. approved; non-rubber petrol hose; vee-ropes; packings and jointings for petrol, oils, etc. **S.B.A.C. Stand 140.**

WILLIAMS AND JAMES (ENGINEERS), LTD., Chequers Bridge, Gloucester (Gloucester 24021-2-3).—A.I.D. and A.R.B. approved. Machining of aircraft components; manufacturers of compressed air, vacuum and hydraulic equipment for ground servicing.

WILLIAMSON AND CO., LTD., W. AND A., 16/24 Brewery Road, Islington, London, N.7 (North 4411/7).—Associate company of British Emulsifiers, Ltd., A.I.D. and A.R.B. approved, aeronautical and general engineers; sheet metal fabricators. **S.B.A.C. Stand 23.**

WINN AND CO., LTD., CHARLES. — See under "Cabin Equipment."

Y.S.C., LTD., THE.—See under "Parachutes, Dinghies and Safety Equipment."

YORKSHIRE COPPER WORKS, LTD.—See under "Materials."

YORKSHIRE ENGINEERING SUPPLIES, LTD.—See under "Materials."

ELECTRICAL

(Including Radio, Radar and Electronics)

AERONAUTICAL RADIO SERVICES, LTD.—See under "Miscellaneous."

AIRMEC, LTD., High Wycombe, Bucks (High Wycombe 2060).—Aircraft intercommunication equipment, electronic test instruments, high frequency induction heating equipment, power transformers.

AMALGAMATED WIRELESS (AUSTRALASIA), LTD.—Australian Associates of Marconi's Wireless Telegraph Co., Ltd., *q.v.* **S.B.A.C. Stand 212.**

AVICA EQUIPMENT, LTD.—See under "Aircraft Parts."

BONNELLA AND SON, LTD., D. H., West Hill, Hoddesdon, Herts (Hoddesdon 82).—Aircraft navigation and identification lamps and glasses; switches, fuses, fuse boxes, terminal blocks, plugs, sockets.

BOOSEY AND HAWKES, LTD. (ELECTRONICS DIVN.), Sonorous Works, Edgware, Middlesex (Edgware 5581). — Magnetic recorders (tape and wire), including special crashproof 24 V aircraft model and battery-operated air travellers' tape recorder.

BRITISH INSULATED CALLENDER'S CABLES, LTD., 21 Bloomsbury Street, London, W.C.1 (Museum 1600).—Manufacturers of all types of electric cables for aircraft, including connecting wires, sleevings and miniature multi-way instrument cables, radio capacitors; Callender-Hamilton hangars; electric cables for airport installations. **S.B.A.C. Stand 155.**

BRITISH THOMSON-HOUSTON CO., LTD., Alma Street, Coventry (Coventry 64181).—Electrical equipment for aircraft, including turbo-starters; high-energy ignition units; booster coils; A.C. and D.C. motors and generators; magnetos, actuators; switches; circuit-breakers; voltage regulators; electronic engine testers. Mazda lamps and lighting equipment. (See also in "Proprietary Equipment" review preceding this directory.) **S.B.A.C. Stand 101.**

BURGESS PRODUCTS CO., LTD., Dukesway, Team Valley, Gateshead-on-Tyne (Low Fell 75322). — Miniature automatic resetting snap-action change-over switches, A.I.D. and A.R.B. approved.

BURNDEPT, LTD., West Street, Erith, Kent (Erith 3080).—Radio telecommunications V.H.F. and U.H.F. equipment; electronic equipment; dinghy transmitters; dry batteries of all types for Service equipment. **S.B.A.C. Stand 118.**

CHELTON (ELECTROSTATICS), LTD., Marlow Bucks (Marlow 1063/4). — "Driwik" static dischargers; aircraft aerial masts and insulated aerial equipment; precision injection mouldings; resin-bonded glass laminates.

CHLORIDE BATTERIES, LTD., Exide Works, Clifton Junction, Swinton, Manchester (Manchester Swinton 2011).—Exide lightweight batteries for all civil and Service aircraft and heavy-duty ground starting units. **S.B.A.C. Stand 52.**

CLANG, LTD., Cricklewood, London, N.W.2 (Gladstone 4201).—Manufacturers of aircraft accessories SC, 5D, 10H, etc. A.I.D. and A.R.B. approved plugs and sockets, Jones type, co-axial; W. and M. switches, terminal blocks.

COLE, LTD., E. K.—See Ekco Electronics, Ltd.

COSSOR RADAR, LTD., Highbury Grove, London, N.5 (Canonbury 1234).—Lightweight radar equipment for airfields; miniature Gee airborne navigational equipment; instruments for test; plastic materials for radar aerial systems. **S.B.A.C. Stand 44.**

CRABTREE AND CO., LTD., J. A., Lincoln Works, Walsall, Staffs (Walsall 2202-7). — Wiring-system components for aircraft and airfield electrical installations.

DECCA NAVIGATOR CO., LTD., 1-3, Brixton Road, London, S.W.9 (Reliance 8111). — Patentees and manufacturers of the Decca Navigator system of navigation; Flight Log and airborne receiving equipment. **S.B.A.C. Stand 198.**

EASCO ELECTRICAL, LTD.—See under "Parachutes, Dinghies and Safety Equipment."

EKCO ELECTRONICS, LTD., Southend-on-Sea, Essex (Southend 49491).—Ekco airborne search radar; Ekco airfield approach aid; V.H.F. aircraft communication equipment; suppressed aerial systems; Electronic and nucleonic equipment. **S.B.A.C. Stand 181.**

ELECTRICAL ENGINEERING CONSTRUCTION CO., LTD., Totnes, Devon (Totnes 3282).—Self-propelled aircraft starting and servicing units.

EVERSHED AND VIGNOLES, LTD.—See under "Aircraft Parts."

FERRANTI, LTD.—See under "Aircraft Instruments."

FRIGIDAIRE DIVISION OF GENERAL MOTORS, LTD., Stag Lane, Kingsbury, London, N.W.9 (Colindale 6541). — Designers and manufacturers of "Delco" D.C. electric motors for use on aircraft, and of rotary transformers. **S.B.A.C. Stand 72.**

GENERAL ELECTRIC CO., LTD.—See under "Factory and Airfield Equipment."

GREENWOOD, LTD., P. W., 62 Shirland Road, Willesden, London, W.9 (Cunningham 9766).—A.I.D. and A.R.B. approved stockists of instruments and electrical accessories and components.

HARLEY AIRCRAFT LANDING LAMPS, St. Neots, Huntingdonshire (St. Neots 230).—Aircraft landing lamps; taxying and manoeuvring lamps; passenger reading lamps; leading-edge de-icing lamps; mobile floodlighting equipment. **S.B.A.C. Stand 5.**

HELLERMANN, LTD.—See under "Aircraft Parts."

HOOVER, LTD.—See under "Factory and Airfield Equipment."

IMHOF, LTD., ALFRED, Radio Telephone Division, 112-6 New Oxford Street, London, W.C.1 (Museum 7878).—Sole distributors of Pye radio equipment; installation and servicing.

INTERNATIONAL AERADIO, LTD.—See under "Miscellaneous."

K.L.G. SPARKING PLUGS, LTD., Putney Vale, London, S.W.15 (Enquiries to Gladstone 3333).—Sparking plugs, igniter plugs, thermocouples and accessories for piston and gas-turbine engines. **S.B.A.C. Stand 4**

LANCEFIELD AIRCRAFT COMPONENTS, LTD.—See under "Aircraft Parts."

LODGE PLUGS, LTD., St. Peter's Road, Rugby, Warwickshire (Rugby 2076).—Aircraft sparking plugs of all types. High-energy igniter plugs and cable sleeves. Servicing and testing equipment, including the new chemical cleaner. **S.B.A.C. Stand 96.**

LONDEX, LTD., Anerley Works, 207, Anerley Road, London, S.E.20 (Sydenham 6258).—Manufacturers of relays, process timers and automatic electrical apparatus. Co-axial and other relays for aircraft use.

M.H.H. ENGINEERING CO., LTD., Bramley, nr. Guildford, Surrey (Bramley 2248).—Torsion wrenches, high-pressure-air regulators, A.G.S. components, electro-hydraulic equipment and electrical switchgear. **S.B.A.C. Stand 22.**

McMICHAEL RADIO, LTD., Equipment Division, Slough, Bucks (Slough 24541).—Radio, electronic and electrical aircraft equipment and ancillaries. Precision electronic research instruments for airborne and ground laboratory use. **S.B.A.C. Stand 201.**

MAGNETIC DEVICES, LTD., Exning Road, Newmarket, Suffolk (Newmarket 3181-2-3). — Electromagnetic relays for aircraft, radio and industrial application. **S.B.A.C. Stand 122.**

MARCONI'S WIRELESS TELEGRAPH CO., LTD., Chelmsford Essex (Chelmsford 3221).—Airport and airborne wireless installations covering a full range of communication, navigational and inter-communication equipments. **S.B.A.C. Stand 211.**

METAL COMPONENTS, LTD.—See under "Aircraft Parts."

MORGAN CRUCIBLE CO., LTD., Battersea Church Road, London, S.W.11 (Battersea 8822).—A.I.D. and A.R.B. approved for electrical brushes, including high-altitude and actuator gear types; electrical contacts; carbon glands, seals, bearings, etc.; sintered-metal bearings.

MULLARD, LTD., Communications and Industrial Valve Department, Century House, Shaftesbury Avenue, London, W.C.2 (Gerrard 7777).—Radio valves, cathode-ray tubes and special electronic devices for communications, navigational and other electronic equipment.

MULLARD, LTD., Equipment Division, Century House, Shaftesbury Avenue, London, W.C.2 (Gerrard 7777).—Radio and telephone communications equipment; electronic instrumentation; aluminium soldering equipment; electronic meteorological apparatus (radar sondes). **S.B.A.C. Stand 111.**

MURPHY RADIO, LTD., Welwyn Garden City, Herts (Welwyn Garden 800).—Radio and radar communication and navigational equipment for aircraft and ground stations, including distance-measuring equipment, radar beacons, V.H.F. transmitter/receivers, passenger announcement systems and voltage regulators. (See also in "Proprietary Equipment" section preceding this directory.) **S.B.A.C. Stand 172.**

NEWMAN INDUSTRIES, LTD., Yate, Bristol (Chipping Sodbury 3311).—Electric motors up to 200 h.p.; machine tools, all types; ferrous and non-ferrous castings.

NEWTON BROTHERS (DERBY), LTD., Alfreton Road, Derby (Derby 47676).—Lightweight aircraft electrical equipment; automatic voltage regulators; rotory transformers and convertors; aircraft generators; high-frequency alternators. **S.B.A.C. Stand 11.**

NIFE BATTERIES, Redditch, Worcs. (Redditch 157).—Nickel-cadmium alkaline batteries for emergency cockpit lighting and for all ground services.

OLDHAM AND SON, LTD., Denton, Manchester (Denton 2431).—Aircraft batteries of maximum capacity-to-weight ratio and unspillability. Types for aircraft and ground starting and lighting. Safety hand lamps, etc. **S.B.A.C. Stand 109.**

OLIVER PELL CONTROL, LTD., Cambridge Row, Woolwich (Woolwich 1422).—Specialists in electromagnets; design and manufacture of coils, transformers, solenoids and relays to customers' requirements.

PAINTON AND CO., LTD., Kingsthorpe, Northampton (Northampton 32354-5).—Electrical and electronic equipment components, including wirewound and high-stability carbon resistors; plugs and sockets; switches; wirewound potentiometers; knobs, dials and pointers.

PETBOW, LTD.—See under "Factory and Airfield Equipment."

PETO AND RADFORD, 137, Victoria Street, London, S.W.1 (Sloane 7164).—"Dagenite" batteries fitted with Porvic separators, polythene connector covers and vents, for all types of aircraft; ground starting units. **S.B.A.C. 144.**

PLESSEY GROUP OF COMPANIES, LTD.—See under "Aircraft Parts."

PRECISION COMPONENTS (BARNET), LTD., 13 Byng Road, Barnet, Herts (Barnet 6867).—Trade name "KABI." Connector blocks; 12-way terminal strips; plastic bench assembly trays; plastic storage trays and bins.

PYE, LTD., Radio Works, Cambridge (Cambridge 3434).—V.H.F. radio equipment for ground-to-air control of aircraft and local control of mobiles, with selective calling facilities and single-channel and multiplex links; radio equipment for long range intercommunication; scientific instruments; plugs; sockets; relays. **S.B.A.C. Stand 122.**

THE AIRCRAFT INDUSTRY . . .

Electrical (continued)

RACAL AEROTRONICS, LTD.—See under "Miscellaneous."

RACAL ENGINEERING, LTD., 274 Worton Road, Isleworth, Middlesex (Hounslow 6256).—Manufacture of radio communications and navigational aid equipment. Radio-vehicle fitting.

RACAL, LTD.—See under "Miscellaneous."

REDIFON, LTD., Broomhill Road, London, S.W.18 (Vandyke 7281).—M.F., H.F. and V.H.F. ground and mobile radio communication and navigational equipment. Flight simulators for aircrew training. **S.B.A.C. Stand 19.**

REVO ELECTRIC CO., LTD.—See under "Factory and Airfield Equipment."

ROSS, COURTNEY AND CO., LTD.—See under "Aircraft Parts."

ROTAX, LTD., Willesden Junction, London, N.W.10 (Elgar 7777).—Complete electrical systems for aircraft, both A.C. and D.C.; invertors; linear and rotary actuators, including undercarriage actuators; de-icing equipment and switchgear; electric, liquid and solid-propellant starters for reciprocating and gas turbine engines. **S.B.A.C. Stand 158.**

SANGAMO WESTON, LTD.—See under "Aircraft Instruments."

SAUNDERS-ROE, LTD. (Electronics Division), East Cowes, Isle of Wight (Cowes 445).—Saunders-Roe Technograph diaphragm gauge.

SAVAGE AND PARSONS, LTD.—See under "Factory and Airfield Equipment."

SCIAKY ELECTRICAL WELDING MACHINES, LTD.—See under "Factory and Airfield Equipment."

SCINTILLA, LTD., 20 Carlisle, Road, The Hyde, Hendon, London, N.W.9 (Colindale 8844).—Manufacturers of camshaft-speed Vertex magnetos and Lesto portable electrical tools. Repairs to aircraft electrical equipment, including Scintilla Bendix magnetos.

SIMON EQUIPMENT, LTD.—See under "Factory and Airfield Equipment."

STANDARD TELEPHONES AND CABLES, LTD., Connaught House, 63 Aldwych, London, W.C.2 (Holborn 8765).—Airborne and ground radio communication and navigation equipment; SenTerCel rectifier stacks and equipment; portable microwave communication links; quartz crystals; magnetic materials; radio interference suppressors; thermistors. **S.B.A.C. Stands 182 and 183.**

STONE AND CO. (DEPTFORD), LTD.—See under "Materials."

TECHNOGRAPH PRINTED CIRCUITS, LTD., 32 Shaftesbury Avenue, London, W.1 (Gerrard 4532).—Anti-icing circuits for any structure; temperature-sensing circuits; foil strain-gauges; etched-foil wiring; slip-ring assemblies; fuses and micro-fuses; and foldable and rigid circuits for all purposes.

THERMAL CONTROL CO., LTD.—See under "Fire-protection Equipment."

THERMIONIC PRODUCTS, LTD., Hythe, Southampton (Hythe 3265). — The Thermionic multi-channel magnetic recorder for airports. Showing on **S.B.A.C. Stand 188** (Tufnol, Ltd.).

TROUP, CURTIS AND CO., LTD., 282 Victoria Dock Road, London, E.16 (Albert Dock 2417).—A.I.D. and A.R.B. approved for repairs and overhauls of aircraft electrical equipment.

ULTRA ELECTRIC, LTD., Western Avenue, Acton, London, W.3 (Acorn 3434).—Gas turbine and turboprop engine electric-controller systems; "Sarah" air/sea rescue equipment; communication control equipment. **S.B.A.C. Stand 6.**

VENNER ACCUMULATORS, LTD., Kingston By-Pass, New Malden, Surrey (Malden 2442).—Lightweight silver-zinc accumulators, one-sixth the weight and one-fifth the size of other accumulators of equivalent capacity.—**S.B.A.C. Stand 169.**

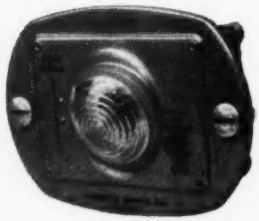
VENNER, LTD., Kingston By-Pass, New Malden, Surrey (Malden 2442). — Magnetic relays, morse-code sender, aircraft emergency lighting unit, time-delay switches, timing equipment. **S.B.A.C. Stand 168.**

VIDOR, LTD.—See Burndept, Ltd., in this section.

WALTERS ELECTRICAL MFG. CO., LTD., 249 Kensal Road, W.10 (Ladbroke 2323/4).—Stewards call systems, illuminated press-switches, illuminated passenger - warning notices, radio operators' morse keys, electrical apparatus, lighting, etc.

WESTINGHOUSE BRAKE AND SIGNAL CO., LTD., 82 York Way, King's Cross, London, N.1 (Terminus 6432).—Metal rectifiers, engine starters, lightweight rectifiers for aircraft power supplies, automatic broadcast announcer. **S.B.A.C. Stand 129.**

Venner aircraft emergency lighting unit, incorporating lightweight accumulator.



meters, pressure gauges, thermometers, etc. **S.B.A.C. Stand 124.**

PULLIN AND CO., LTD., R. B., Phoenix Works, Great West Road, Brentford, Middlesex (Ealing 0011-3 and 3661-3).—Electrical and electronic engineers; scientific-instrument manufacturers; specialists in gyroscopic apparatus. Aircraft equipment includes electrical turn-and-slip indicators, dimmer switches, "S" type magnetic relay switches, etc.

ROTHERHAM AND SONS, LTD.—See under "Aircraft Parts."

SALFORD ELECTRICAL INSTRUMENTS, LTD., Silk Street, Salford, Lancs (Blackfriars) 6688).—Quartz crystal units and test gear, radio compass, radio altimeter, radiosonde and ground station; metal rectifiers; Gecalloy cores; all types of instruments. **S.B.A.C. Stand 42.**

SANGAMO WESTON, LTD., Enfield, Middlesex (Enfield 3434).—Electrical instruments for power, temperature, pressure and movement indication, navigational aids, ground test-sets, tachometer, icing detector and servo potentiometer. **S.B.A.C. Stand 171.**

SAVAGE AND PARSONS, LTD.—See under "Factory and Airfield Equipment."

SMITHS AIRCRAFT INSTRUMENTS LTD., Cricklewood Works, London, N.W.2 (Gladstone 3333).—Automatic pilots and complete range of aircraft instruments, including flight, navigation and engine instruments. (See also in "Proprietary Equipment" review preceding this directory.) **S.B.A.C. Stand 2.**

SPERRY GYROSCOPE CO., LTD., Great West Road, Brentford, Middlesex (Ealing 6771).—Aircraft gyroscopic flight instruments, navigational equipment and automatic pilots; Gyrosyn compasses, gyro horizons, Zero Reader flight indicator, gyro-pilots. (See also under "Proprietary Equipment" review preceding this directory.) **S.B.A.C. Stand 145.**

TEST EQUIPMENT, LTD.—See under "Factory and Airfield Equipment."

TINSLEY AND CO., LTD., H., Werndee Hall, South Norwood, London, S.E.25 (Addiscombe 1400).—Sensitive galvanometers for use in aircraft and ground installations; temperature indicators.

WAYMOUTH GAUGES AND INSTRUMENTS, LTD., Station Road, Godalming, Surrey (Enquiries to Gladstone 3333).—Electrostatic fuel-contents gauges, jet-engine temperature controllers, magnetic relay equipment. **S.B.A.C. Stand 1.**

WYNN AND CO., E. D.—See under "Miscellaneous."

WYNSTRUMENTS, LTD.—See under "Miscellaneous."

Electric gyro-horizon —one of the range of Ferranti instruments.

AIRCRAFT INSTRUMENTS

A.J.W. (INSTRUMENTS) LTD., Gatwick Airport, Horley, Surrey (Horley 1420 and 1510), Ext. 38 and 105).—Overhaul and supply of all types of aircraft instruments, gyro-pilot installations, etc.

BRYANS AEROQUIPMENT, LTD., Willow Lane, Mitcham, Surrey (Mitcham 1607). Designers and manufacturers of test equipment for flight and engine instruments; cabin pressurization equipment and oxygen-demand regulators. **S.B.A.C. Stand 43.**

ELLIOTT BROS. (LONDON), LTD., Century Works, London, S.E.13 (Tideway 3232).—Automatic pilot for Jindivik pilotless aircraft; automatic stabilizers for high-speed aircraft; microwave instruments, "X" and 8-9 mm. band; aircraft-instrument repairs. **S.B.A.C. Stand 128.**

FERRANTI, LTD., Hollinwood, Lancashire (Failsworth 2000); Moston, Manchester, 10 (Failsworth 2271 and 2071); Crew Toll, Edinburgh, 5 (Granton 89181).—Ferranti aircraft simulators, airstream direction indicators, Mk 4E and Mk 5 gyroscopic gunsights, electronic digital computers, high-speed tape readers, electric gyro-horizon Mk 4. **S.B.A.C. Stand 71.**

KELVIN AND HUGHES (AVIATION) LTD., New North Road, Barkingside (Hainault 2601) and Winchester Road, Basingstoke (Basingstoke 690).—Navigational, flight and engine instruments, including sextants, compasses, turn-and-slip indicators, altimeters. **S.B.A.C. Stand 3.**

KENT, LTD., GEORGE, Biscot Road, Luton (Luton 2440).—Aircraft fuel-flow meters; oil and petrol meters for refuellers.

LONDON NAME PLATE MFG. CO., LTD., 25 Victoria Street, London, S.W.1 (Abbey 7381).—"Douglas" protractor and other navigational aids.

MARCONI INSTRUMENTS, LTD.—See under "Factory and Airfield Equipment."

MECHANISM, LTD., George Street, Croydon, Surrey (Croydon 4240 and 2144).—A.I.D. and A.R.B. inspection and design-approved. Machmeters, indicating and contacting; altimeters, pressure gauges, suction gauges, V-G and V-H recorders.

NEGRETTI AND ZAMBRA, LTD., 122 Regent Street, London, W.1 (Regent 3406).—Manufacturers of aeronautical, meteorological and industrial instruments — fuel-flow

CABIN EQUIPMENT

AEROLEX, LTD.—See under "Aircraft Parts."

AIRSCREW CO. AND JICWOOD, LTD.—See under "Factory and Airfield Equipment."

ANTICOUSTIC CO.—See under "Miscellaneous."

ATTEWELL AND SONS, LTD., B.—See under "Aircraft Parts."

BENSON, J. J., 872/6 London Road, Leigh-on-Sea, Essex (Leigh-on-Sea 77423).—Aircraft interior furnishing. Dunlopillo handbuilders and stockists.

BRYANS AEROQUIPMENT, LTD.—See under "Aircraft Instruments."

CONNOLLY BROS. (CURRIERS) LTD., 39/43 Chalton Street, London, N.W.1 (Euston 1661/5).—Leather for aircraft seating and panelling ("Vaumol" brand). Lightweight "Dulon" material for fuselage interior furnishing, etc. **S.B.A.C. Stand 149.**

DELANEY GALLAY, LTD.—See under "Aircraft Parts."

DRAGONAIR, LTD., Fitzherbert Street, Farlington, nr. Portsmouth, Hants (Cosham 76541). — Heating equipment for aircraft cabins; combustion heaters; air-conditioning equipment; hangar-heating equipment. **S.B.A.C. Stand 216.**

FIBREGLASS, LTD.—See under "Materials."

FIRTH AND SONS, LTD., T. F., Africa House, Kingsway, London, W.C.2 (Holborn 4091).—Wool upholstery; lightweight materials in a range of colours and designs for aircraft furnishing; lightweight wool carpet in a variety of colours in plain and non-crush effects. **S.B.A.C. Stand 9**

GENERAL ELECTRIC CO., LTD.—See under "Factory and Airfield Equipment."

GODFREY AND PARTNERS, LTD., SIR GEORGE—See under "Aircraft Parts."

HAIRLOK CO., LTD., Iddesleigh House, Caxton Street, London, S.W.1.—"Hairlok" rubberised hair, moulded packaging for instruments, etc., headrolls, seats, backs, etc. "Texfoam" latex foam cushions, luxury seats, etc. "Seatex" hair-reinforced latex foam lightweight cushions, etc. **S.B.A.C. Stand 8.**

HARLEY AIRCRAFT LANDING LAMPS.—See under "Electrical."

HOLDSWORTH AND CO., LTD., JOHN, Shaw Lodge Mills, Halifax (Halifax 3266).—Manufacturers of lightweight seating materials and special lightweight carpets for all types of aircraft.

Movement Controlled -by the VIG/1AR

The David Brown VIG/1AR Tractor towing R.M.A. DISCOVERY, the Flagship of the B.E.A. Viscount (Discovery Class) Fleet at the 1952 S.B.A.C. Show.

By courtesy of "The Aeroplane"

A DRAWBAR PULL OF 3800 LB. enables the David Brown VIG/1AR to handle aircraft up to the Discovery, Convair, Viking, and Dakota class with ease and safety. The 4-speed gearbox with its low ratio 1st gear equips the driver for full-power 'break-out' with easy under-way gear-shift to suitable working speed. The David Brown VIG/1AR speeds up ground movement, lowers fuel costs, and although primarily designed for aircraft handling it can turn its hand to every conceivable haulage job around the airfield.

★ OHV ENGINE DEVELOPS 39 B.H.P. ★ 3800 LB. DRAWBAR PULL
★ TOP SPEED 22 M.P.H. ★ LARGE TYRES GIVE GREATER TRACTION
★ EXCEPTIONAL FUEL ECONOMY ★ WIDE BENCH-TYPE SEAT
★ FULL LIGHTING AND STARTING EQUIPMENT

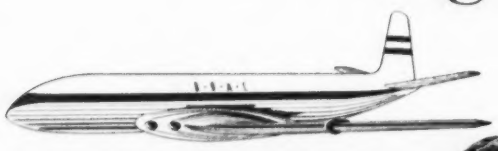
DAVID BROWN

INDUSTRIAL TRACTORS

THE DAVID BROWN CORPORATION (SALES) LIMITED

TRACTOR DIVISION, MELTHAM, HUDDERSFIELD

Which is the Flight Simulator*



used by B.O.A.C?

B.O.A.C. photograph

B.O.A.C. photograph

which is the Comet?

In the Redifon Flight Simulator, every necessary detail of the flight deck is reproduced in full scale, so ensuring that the process of familiarisation and the use of flight and power controls are thoroughly appreciated by the trainee crew.

The considerable economies achieved with the Redifon Stratocruiser Flight Simulator, influenced the B.O.A.C. Executive in placing a contract with Redifon for the Comet Series 1 Simulator.

Delivered last year, this new machine is now fully utilised in training B.O.A.C. crews and those of other Comet users.

* *The Redifon Simulator is on the right.*

Redifon

FLIGHT SIMULATORS

Flight Simulator Division

REDIFON LIMITED, WEBBER STREET, LONDON, S.E.1

THE AIRCRAFT INDUSTRY . . .

Cabin Equipment (continued)

IMPERIAL CHEMICAL INDUSTRIES, LTD., Leathercloth Division, Hyde, Cheshire (Hyde 651).—"Vynide" flame-resistant polyvinyl-chloride-coated fabric, in various weights and new and interesting designs for aircraft seating and panelling.

IMPERIAL CHEMICAL INDUSTRIES, LTD. (Plastics Division).—See under "Aircraft Parts."

JABLO PROPELLERS, LTD.—See under "Materials."

LANCEFIELD AIRCRAFT COMPONENTS, LTD.—See under "Aircraft Parts."

LATEX UPHOLSTERY, LTD., 41 Lonsdale Road, London, W.11 (Bayswater 6262-5). — Passenger luxury and high-density seating; latex foam and rubberised-hair fillings; cushions; padding; textile equipment; passenger safety-belts. **S.B.A.C. Stand 167.**

M. L. AVIATION CO., LTD.—See under "Military Aircraft Special Equipment."

MARSTON EXCELSIOR, LTD.—See under "Aircraft Parts."

MARTIN-BAKER AIRCRAFT CO., LTD.—See under "Military Aircraft Special Equipment."

NORMALAIR, LTD., Yeovil, Somerset (Yeovil 1100).—Designers and manufacturers of valves and instruments for pressure-cabin air control; high-altitude oxygen-breathing equipment. Operates high-altitude chambers and laboratory for research and development in these problems. (See also under "Proprietary Equipment" review preceding this directory.) **S.B.A.C. Stand 47.**

PYTRAM, LTD.—See under "Aircraft Parts."

ROLLASON AEROCESSORIES, LTD.—See under "Factory and Airfield Equipment."

RUMBOLD AND CO., LTD., L. A., Kingsgate Place, Kilburn, London, N.W.6 (Maida Vale 7366).—Designers and manufacturers of complete aircraft furnishings and soundproofing, A.I.D. and A.R.B. design approval. Wide range of aircraft seats from high-density to luxury seating.

SIEBE, GORMAN AND CO., LTD.—See under "Military Aircraft Special Equipment."

SUNTEX SAFETY GLASS INDUSTRIES, LTD. — See under "Aircraft Parts."

TEDDINGTON CONTROLS, LTD.—See under "Aircraft Parts."

TRIPLEX SAFETY GLASS CO., LTD.—See under "Materials."

VICKERS-ARMSTRONGS, LTD., Weybridge, Surrey (Byfleet 240).—Aircraft seating, fuel components and accessories. **S.B.A.C. Stand A.**

VOKES, LTD.—See under "Aircraft Parts."

WALLINGTON WESTON AND CO., LTD.—See under "Materials."

WARERITE, LTD., Ware, Herts (Ware 502) (unit of Bakelite, Ltd.).—Decorative laminated plastics. Panels, veneered board and Handy panels for linings, furniture surfaces, galley-units, pictorial panels for damage-resistant notices, diagrams, murals.

WALTERS ELECTRICAL MFG. CO., LTD.—See under "Electrical."

WILKINSON RUBBER LINATEX, LTD., Frimley Road, Camberley, Surrey (Camberley 1595).—Linatex rubber seals for doors, windows, hatches, etc., including seals for aircraft with pressurized cabins. Flexatex non-rubber hose. Novatex plastic seals.

WILLIAMSON AND SON, LTD., JAS., Lune Mills, Lancaster (Lancaster 5222).—Fire-resistant, durable, lightweight, non-slip, hard-surfaced floor-covering, and fire-resistant vinyl-coated upholstery cloth.

WINN AND CO., LTD., CHARLES, Granville Street, Birmingham 1 (Midland 7151).—Water supply and special sanitary equipment for aircraft, to standard or customers' design.

MILITARY-AIRCRAFT SPECIAL EQUIPMENT

(Armament, Ejector Seats, etc.)

AIRMED, LTD., Harlow, Essex (Harlow 2331/2).—Aircraft breathing equipment, including masks and connecting tubing.

AIR TRAINERS, LTD.—See under "Miscellaneous."

BOULTON PAUL AIRCRAFT, LTD.—See under "Aircraft Parts."

BRITISH, FOREIGN AND COLONIAL AUTOMATIC LIGHT CONTROLLING CO., LTD., 100 Holdenhurst Road, Bournemouth (Bournemouth 1445).—Timing mechanisms and mechanical fusing equipment.

BRITISH MANUFACTURE AND RESEARCH CO., LTD., Springfield Road, Grantham, Lincs (Grantham 700). — Hispano-Suiza guns, and shells, fuses and belt-feed mechanisms; power- and hand-operated gun mountings. **S.B.A.C. Stand 139.**

BROOKLANDS AVIATION, LTD.—See under "Miscellaneous."

FERRANTI, LTD.—See under "Aircraft Instruments."

G. Q. PARACHUTE CO., LTD.—See under "Parachutes, Dinghies and Safety Equipment."

IRVING AIR CHUTE OF GREAT BRITAIN, LTD.—See under "Parachutes, Dinghies and Safety Equipment."

LANCEFIELD AIRCRAFT COMPONENTS, LTD.—See under "Aircraft Parts."

M. L. AVIATION CO., LTD., White Waltham Aerodrome, Maidenhead, Berks (Littlewick Green 248).—Radio-controlled pilotless target aircraft; high-speed target towing equipment; pressure cabin signal pistols; gunsight retraction mountings; mobile air-conditioning equipment. **S.B.A.C. Stand 218.**

MARTIN-BAKER AIRCRAFT CO., LTD., Higher Denham, Uxbridge, Middlesex (Denham 2214).—Designers and manufacturers of ejector seats; ejector-seat mobile training towers; gun feeds and mountings, etc., and other armament components; airscrew-feathering controls. **S.B.A.C. Stand 81.**

R.F.D. CO., LTD.—See under "Parachutes, Dinghies and Safety Equipment."

SCHERMULY PISTOL ROCKET APPARATUS, LTD., THE—See under "Parachutes, Dinghies and Safety Equipment."

SIEBE, GORMAN AND CO., LTD., Tolworth, Surbiton, Surrey (Elmbridge 5900).—Aircraft oxygen apparatus, aircraft safety belts, air compressors, self-contained breathing apparatus, protective clothing for fire-fighting. **S.B.A.C. Stand 114.**

SUNTEX SAFETY GLASS INDUSTRIES, LTD. — See under "Aircraft Parts."

TRIPLEX SAFETY GLASS CO., LTD.—See under "Materials."

VINTEN LTD., W.—See under "Miscellaneous."

WILLIAMSON MANUFACTURING CO., LTD.—See under "Miscellaneous."

Y.S.C., LTD., THE.—See under "Parachutes, Dinghies and Safety Equipment."

PARACHUTES, DINGHIES AND SAFETY EQUIPMENT

BRITISH BELTING AND ASBESTOS, LTD. — See under "Materials".

EASCO ELECTRICAL LTD., Brighton Terrace, London, S.W.9 (Brixton 4961).—A.R.B. approved for air-sea rescue equipment; lifejacket lights, raft and buoy lights, portable searchlights, hand lamps, battery-charging equipment.

ELLIOT EQUIPMENT, LTD., Llwynypia, Rhondda, Glamorgan, South Wales (Tonypandy 3232).—Dinghies, equipment-dropping parachutes, flying clothing, life-saving jackets, packs. A.I.D. and A.R.B.

FRANKENSTEIN AND SONS (MANCHESTER) LTD., P., Newton Heath, Manchester, 10 (Failsworth 1166).—Civilian and Services lifejackets; inflatable exposure-suits; flying overalls; constant-wear immersion suits; specialized rubber proofings to D.T.D. specifications. **S.B.A.C. Stand 27.**

G.Q. PARACHUTE CO., LTD., Woking, Surrey (Woking 2277).—Parachutes; supply-dropping containers; aircrew, stretcher and air/sea rescue safety harnesses; brake and tail anti-spin parachutes. **S.B.A.C. Stand 227.**

IRVING AIR CHUTE OF GREAT BRITAIN, LTD., Letchworth, Herts (Letchworth 888).—M.o.S.-approved for design and development of all types of parachutes, including anti-spin and braking parachutes. **S.B.A.C. Stand 89.**

R.F.D. CO., LTD., Catteshall Lane, Godalming, Surrey (Godalming 1441).—Lifejackets; dinghies and rafts; survival equipment; gunnery training equipment; drogue, banner and winged targets; paratroop-training equipment; aircraft components and sub-assemblies. **S.B.A.C. Stand 12.**

SCHERMULY PISTOL ROCKET APPARATUS, LTD., THE, Newdigate, Surrey (Newdigate 331), and 51 Coleman Street, London, E.C.2.—Pyrotechnic stores for runway illumination, emergency landing, aircraft control, high-altitude signalling, air-sea rescue distress signalling, target identification, etc. **S.B.A.C. Stand 223.**

SIEBE, GORMAN AND CO., LTD.—See under "Military Aircraft Special Equipment."

SUCAL INDUSTRIAL CLOTHING, Kangley Bridge Road, Lower Sydenham, London, S.E.26 (Sydenham 7016).—Aircraft safety equipment—protective clothing and armoured vests.

ULTRA ELECTRIC, LTD.—See under "Electrical".

Y.S.C. LTD., THE, 45/47 Copeland Road, London, S.E.15 (New Cross 6113).—Pyrotechnic dept.: Y. S. C. standard "Very" cartridges and aeronautical pyrotechnics. Engineering dept: Precision details for the aircraft industry (screws, bolts, etc., etc.).

FIRE PROTECTION

AIRFOAM FIRE PROTECTION, LTD., 166 Victoria Street, London, S.W.1 (Victoria 3121).—Aerodrome Foam CO_2 crash tenders, water bowsers, auxiliary domestic fire tenders and other aerodrome fire-protection ground equipment.

GENERAL FIRE APPLIANCE CO., LTD., 11 Waterloo Place, London, S.W.1 (Trafalgar 3765/7).—Chlorobromomethane (C.B.) equipment for airfields and crash fires; all fire protection equipment supplied.

GRAVINER MFG. CO., LTD., Poyle Mill Works, Colnbrook, Bucks (Colnbrook 48/49).—Manufacturers of airborne hand and full automatic fire-protection and ancillary equipment for prevention and extinction of fires in aircraft. **S.B.A.C. Stand 104.**

KIDDE CO., LTD., THE WALTER, Lux Works, Belvue Road, Northolt, Middlesex (Waxlow 1061).—Airfield fire-fighting tenders and equipment.

MERRYWEATHER AND SONS, LTD., Greenwich High Road, London, S.E.10 (Tideway 1016).—Fire engines, crash tenders, trailer pumps, fire extinguishers, smoke helmets, asbestos clothing, all varieties of fire-fighting equipment.

PYRENE COMPANY, LTD., THE, 9 Grosvenor Gardens, London, S.W.1 (Victoria 3401) and Great West Road, Brentford, Middlesex.—Fire equipment for aircraft, including both detection and extinguishing systems; portable, mobile and fixed appliances for airfields. Also steel collapsible wheel-chocks; Parkerising and Bonderising metal-finishing processes. **S.B.A.C. Stand 40.**

PYRENE, LTD., THE, Great West Road, Brentford, Middlesex. Fire-detecting and extinguishing systems for aircraft; wheel chocks; airfield crash tenders; fixed, mobile, and portable fire appliances. **S.B.A.C. Stand 40.**

SIEBE, GORMAN AND CO., LTD.—See under "Military Aircraft Special Equipment."

THERMAL CONTROL CO., LTD., Marine Works, Sackville Road, Hove, Sussex (Hove 34081 and 35929).—Aircraft fire-detection equipment, pressure-operated switches, aircraft wiring and junction boxes. **S.B.A.C. Stand 115.**

VOSPER, LTD.—See under "Miscellaneous."

FUELS AND LUBRICANTS

(Including Special-purpose Fluids and Refuelling Equipment)

AUTOMOTIVE PRODUCTS CO., LTD.—See under "Aircraft Parts."

AVERY-HARDOLL, LTD., Oakcroft Road, Tolworth, Surbiton, Surrey (Elmbridge 5221).—Designers and manufacturers of pressure refuelling equipment, self-sealing couplings for aviation fuels, oils, water-methanol and other liquids. High-capacity bulk meters for all uses, including test rigs and calibration purposes. **S.B.A.C. Stand 53.**

BENNETT (HYDE), LTD., Boston Mills, Hyde.—"Gunk" degreasant and cleaner for airframes, engines, components, hangar floors, workshops, and airfield aprons.

BOORN AND CO., LTD., THOMAS—See under "Aircraft Parts."

BOWDEN (ENGINEERS) LTD.—See under "Aircraft Parts."

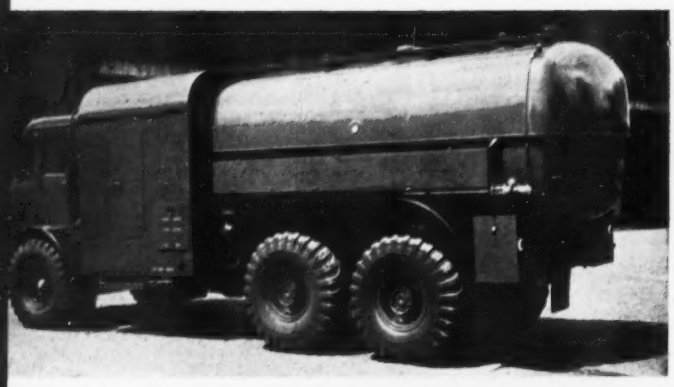
COOPERS MECHANICAL JOINTS, LTD.—See under "Aircraft Parts."

DUCKHAM AND CO. LTD., ALEXANDER, Hammersmith, London, W.6 (Fulham 3300).—Manufacturers of lubricating oils and greases, cutting fluids, preservatives and rust preventatives, skin cleansers and barrier creams.

ESSO PETROLEUM CO., LTD. 36 Queen Anne's Gate, London, S.W.1 (Whitehall 5151).—Suppliers of fuels and lubricants and special products for the aviation industry. **S.B.A.C. Stand 215.**

EXACTOR, LTD.—See under "Aircraft Parts."

FLIGHT REFUELLING, LTD., Tarrant Rushton Airfield, Blandford, Dorset (Blandford 501).—Air and ground pressure-refuelling



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THE AIRCRAFT INDUSTRY . . .

Fuels and Lubricants (continued)

(Including Refuelling Equipment)

equipment and components. Airframe component construction; repair, maintenance, modification, overhaul and conversion of aircraft. **S.B.A.C. Stand 7.**

GULF OIL (GREAT BRITAIN), LTD., Minoco Wharf, West Silvertown, London, E.16 (Albert Dock 3131).—Manufacturers of high-grade aero engine oils approved by Ministry of Supply and used by the Services and aircraft manufacturers.

HALL AND HALL, LTD.—See under "Materials."

HIGH-PRESSURE COMPONENTS, LTD.—See under "Aircraft Parts."

KENILWORTH MANUFACTURING CO., LTD.—See under "Materials."

KENT, LTD., GEORGE—See under "Aircraft Instruments."

KILFROST MANUFACTURING CO., LTD., 1 St. Nicholas Buildings, Newcastle-upon-Tyne (Newcastle 20448); Works, Haltwhistle (332).—Manufacturers of de-icing fluids for removal of ice and hoar-frost; fluids used with T.K.S. system.

MANCHESTER OIL REFINERY (SALES), LTD., Twining Road, Trafford Park, Manchester 17 (Trafford Park 0218/9).—Manufacturers of lubricating oils, transformer oils and greases; also flaw detection inks for both magnetisable and non-magnetisable materials.

R.M.R. ENGINEERING.—See under "Aircraft Parts."

RAGOSINE OIL CO., LTD., Minerva Works, Woodlesford, Near Leeds (Rothwell 2164).—Lubricant manufacturers. Specialists in molybdenum disulphide lubricants, instrument oils, and extreme-viscosity compounds for the optical instruments and electronics industries.

SHELL-MEX AND B.P., LTD., Shell-Mex House, Strand, London, W.C.2 (Temple Bar 1234).—Distributors of petroleum products for aviation; Shell Aviation Service; B.P. Aviation Service. **S.B.A.C. Stand 121.**

STREAM-LINE FILTERS, LTD., Ingate Place, London, S.W.8 (Macaulay 1011).—Filters for aviation refuelling purposes and for used lubricating oils.

SUPER OIL SEALS AND GASKETS, LTD.—See under "Aircraft Parts."

TECALEMIT, LTD., Plymouth and Brentford (Plymouth 2844 and Ealing 6661).—Manufacturers of lubrication equipment for aircraft and ancillary ground equipment; also engine and fuel-oil filters. **S.B.A.C. Stand 151.**

THOMPSON BROS. (BILSTON), LTD., Bradley Engineering Works, Bilston, Staffs (Bilston 41264/8).—Specialists in aircraft fuelling equipment and aircraft engine metalwork. **S.B.A.C. Show Static Park.**

TRIST AND CO., LTD., RONALD—See under "Aircraft Parts."

VACUUM OIL CO., LTD., Caxton House, London, S.W.1. (Whitehall 1010).—Mobiloil Aero engine oils, Mobil hydraulic oils, fluids, and specialities; Mobilgrease aero greases.

VAUGHAN AND CO., LTD., EDGAR, Legge Street, Birmingham, 4 and branches (Aston Cross 2071).—Oils and greases for the metal-working industry; hydraulic oils, rust preventatives, mechanical leathers.

VOKES, LTD.—See under "Aircraft Parts."

VOSPER, LTD.—See under "Miscellaneous."

WAKEFIELD AND CO., LTD., C. C., 46 Grosvenor Street, London, W.1 (Mayfair 9232). — Castrol-aero aviation and Castrol motor lubricants. Wakefield Lubrequipment; lubrication appliances of all types.

WILKINSON RUBBER LINATEX, LTD.—See under "Cabin Equipment."

WILLCOX AND CO., LTD, W. H.—See under "Aircraft Parts."

ZWICKY, LTD., Slough, Bucks (Slough 24481).—Airfield refuelling units, lightweight rotor pumps, aircraft pressure-refuelling valves, pressure controllers, automatic tank filling nozzles, aircraft fuel filter, etc. **S.B.A.C. Stand 55.**

PAINTS AND FINISHES

(Including Protective Processes)

BRAND AND CO., LTD., R. A.—See under "Miscellaneous."

BRITISH TRANSFER PRINTING CO., LTD.—See under "Miscellaneous."

CELLON, LTD., Kingston-on-Thames, Surrey (Kingston 1234).—Manufacturers of high-speed finishes and protective coatings for aircraft to A.I.D and A.R.B. specifications; also Cellon pre-treatment primers, Celloseel kerosene- and Ester-lubricant-resistant jointing compound. **S.B.A.C. Stand 102.**

DOCKER BROTHERS, Ladywood, Birmingham 16 (Edgbaston 4111).—Specialists in aircraft paints. Materials fully approved, including high-speed finishes, lightweight schemes, etch primers, oil-resisting finishes, paint removers and polishes, especially for Perspex. Finishes for airport buildings and equipment. **S.B.A.C. Stand 79.**

FERRO ENAMELS, LTD., Wombourn, Wolverhampton (Wombourn 2281).—Manufacturers of high-temperature ceramic coatings including "Solaramid." Designers and manufacturers of furnaces and kilns for H.T. ceramic coatings.

HALL AND SONS (BRISTOL AND LONDON), LTD., JOHN, Hengrove, Bristol (Whitchurch 2162), and St. Pancras Way, London (Euston 2262).—Cellulose and synthetic aircraft finishes, "Liquid Envelope" protective materials, factory paints. **S.B.A.C. Stand 137.**

IMPERIAL CHEMICAL INDUSTRIES, LTD. (Paints Division), Wrexham Road, Slough, Bucks (Slough 23851).—Full range of aircraft finishes to A.I.D. and defence specifications and A.R.B. requirements. Etching primer; fire-resisting clear and coloured dopes; Aero "Dulite" lightweight finishes; paint remover; metal pre-treatments. **S.B.A.C. Stand 51.**

JENOLITE, LTD., 43 Piazza Chambers, Covent Garden, London, W.C.2 (Temple Bar 1745, 3058, 5059).—Metal pre-treatment chemicals: rust and scale removers and inhibitors; paint keying agents; paint strippers; degreasants; black finishes; soldering solutions. **S.B.A.C. Stand 46.**

JENSON AND NICHOLSON, LTD., 36 St. James's Street, London, S.W.1 (Regent 6060).—Paints, enamels, varnishes, lacquers, dopes, etc. "Liquid Envelope" strippable protective coating.

KENILWORTH MANUFACTURING CO., LTD.—See under "Materials."

LLEWELLYN RYLAND, LTD., Balsall Heath Works, Birmingham 12 (Calthorpe 2284-5-6).—Protective and decorative coatings to A.I.D. and A.R.B. requirements; Cellulose dopes and lacquers; oil primers and synthetic finishes; seaplane varnish: "Duralac" jointing compound; paint for hangars, factories, airport buildings. **S.B.A.C. Stand 106.**

MODERN INDUSTRIAL FINISHES, Ltd., Lower Road, Northfleet, Gravesend, Kent (Gravesend 4922).—M.o.S.-approved "Sorco" finishes, resistant to Ester lubricants; high-temperature-resistant coatings for gas turbines.

PAINT REMOVERS, LTD., 24 Ryder Street, London, S.W.1 (Trafalgar 4161).—"Offkwik" paint remover.

TITANINE, LTD., Sheaveshill Avenue, Colindale, London, N.W.9 (Colindale 8123).—Aircraft finishes to current A.I.D. and A.R.B. requirements. Exterior and interior finishes for civil aircraft. Paints for ground equipment and aerodrome buildings. **S.B.A.C. Stand 153.**

FACTORY AND AIRFIELD EQUIPMENT

ACRATORK ENGINEERING CO., LTD., Corys' Buildings, Bute Street, Cardiff (Cardiff 31141).—Precision torque spanners and torque generators. Test and setting rigs. R.A.E. approved.

ADCOLA PRODUCTS, LTD., Cranmer Court, Clapham High Street, London, S.W.4 (Macaulay 4272).—Manufacturers of soldering instruments and materials.

AERO CONTROLS, LTD. — See under "Aircraft Parts."

AIRMEC, LTD.—See under "Electrical."

AIRSCREW CO. AND JICWOOD, LTD., Weybridge, Surrey (Weybridge 1600). — Electric fans and blowers; wind-tunnel fans; aircraft propellers; and windmills. **S.B.A.C. Stand 45.**

AMAL, LTD.—See under "Aircraft Parts."

ATTEWELL AND SONS, LTD., B.—See under "Aircraft Parts."

AUTO DIESELS, LTD., Uxbridge, Middlesex (Uxbridge 5681).—Mobile aircraft starting and servicing units, including Crompton Parkinson Auto Diesel dual-voltage machines. **S.B.A.C. Show Static Park.**

AUTOMATIC COIL WINDER AND ELECTRICAL EQUIPMENT CO., LTD., Winder House, Douglas Street, London, S.W.1.—Manufacturers of A.I.D. and A.R.B. approved radio and electronic test gear and coil-winding machines.

AUTOMOTIVE PRODUCTS CO., LTD.—See under "Aircraft Parts."

AUTOSET (PRODUCTION), LTD., Stour Street, Birmingham (Edgbaston 1143).—Heavy-duty industrial castors; suspension slides for radar, etc., equipment; semi-precision ball journals; engineers' work- and tool-clamps; door runners, etc.

AVERY-HARDOLL, LTD.—See under "Fuels and Lubricants."

AVIATION AND ENGINEERING PROJECTS, LTD.—See under "Miscellaneous."

AVIATION DEVELOPMENTS, LTD., 229/231, High Holborn, London, W.C.2 (Chancery 8601). — Chobert automatic, and Avdel self-plugging, blind riveting systems. Pip quick-release pins, Avdel sheet-grippers, close-tolerance rivets. **S.B.A.C. Stand 204.**

B.S.A. TOOLS, LTD., Marston Green, Birmingham (Stetchford 3071).—High-production metalworking machine tools and small tools—multi-spindle bar and chucking machines, centreless grinders, drills, cutters, screwing tackle, etc.

BAIRD TELEVISION, Ltd.—Lancelot Road, Wembley, Middlesex (Wembley 6191).—Special-purpose magnetic-tape recorders for recording industrial measurement data.

BALFOUR AND CO., LTD., ARTHUR.—See under "Materials."

BALLINGER, LTD., L. J. H., Woodchester, Stroud, Glos (Amberley 3231).—Abrasive-wheel cutting-off machines for bars, tubes, sections and slabs in the difficult alloys. Hydraulic test rigs and equipment.

BARDOLPH AND PARTNERS, LTD., J. F., 1 Robert Street, Adelphi, London, W.C.2 (Trafalgar 1927-9).—Concessionaires for Myers riveting clamps; radar reflectors.

BARLOW-WHITNEY, LTD., Coombe Road, London, N.W.10 (Gladstone 1152).—Process heating equipment.

BELLMAN HANGARS, LTD., Terminal House, Grosvenor Gardens, London, S.W.1 (Sloane 5259).—Erection, repair and maintenance engineers; manufacturers of hangars and large-span and unit-construction industrial buildings.

BELL'S ASBESTOS AND ENGINEERING, LTD.—See under "Aircraft Parts."

BENNETT (HYDE), LTD.— See under "Fuels and Lubricants."

BENTON AND STONE, LTD.—See under "Aircraft Parts."

BIRLEC, LTD., Birlec Works, Tyburn Road, Birmingham, 24 (East 1471).—Gas and electric heat-treatment furnaces; electric arc and induction melting furnaces; adsorption drying equipment for maintaining low humidities in process air or gas flows, and storage and test rooms.

BLACK AND DECKER, LTD., Harmondsworth, Middlesex (West Drayton 2681).—Manufacturers of portable electric drills, sanders, grinders, polishers, screwdrivers, saws and valve and valve-seat reconditioning equipment.

BLACKBURN AND GENERAL AIRCRAFT, LTD., Brough, E. Yorks (Brough 121).—Pipe-bending equipment. (See also in main aircraft review section of this issue.) **S.B.A.C. Stand K.**

BRITISH INSULATED CALLENDER'S CABLES, LTD.—See under "Electrical."

BROWN BROTHERS (AIRCRAFT), LTD.—See under "Aircraft Parts."

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THE AIRCRAFT INDUSTRY . . .

Factory and Airfield Equipment (Continued)

BROWN TRACTORS, LTD., DAVID, Meltham, Yorkshire (Meltham 361).—Tractors for airfield haulage.

BRUNTONS (MUSSELBURGH), LTD.—See under "Factory and Airfield Equipment."

BRYANS AEROQUIPMENT, LTD.—See under "Aircraft Instruments."

BURGESS PRODUCTS CO., LTD., Hinckley, Leics. (Hinckley 700).—Electric hand-engraving tools, acoustic telephone booths and teleprinter covers, engine silencers and air-filters.

BURTON GRIFFITHS AND CO., LTD. (B.S.A. TOOLS GROUP).—Machine tools: Marston Green, Birmingham (Stechford 3071). Small tools: Montgomery Street, Birmingham, 11 (Victoria 2351).—Distributors of British, American and European metalworking plant.

CHAMBERLAIN INDUSTRIES, LTD., Staffa Works, Leyton, E.10 (Leytonstone 3678).—Mobile and overhead travelling cranes; bending machines; steel and aluminium-alloy standard buildings. Patent steel flooring; structural steelwork; building and contracting.

CLICO, LTD., Meadow Works, Meadow Street, Sheffield, 3 (Sheffield 26504).—Specialists in aircraft production tools, including router cutters.

COLLINGRIDGE, LTD., B. F., Belvedere Works, Feltham, Middlesex (Feltham 2654).—Manufacturers of aircraft passenger steps (hydraulically operated), water bowsers, de-icer bowsers and luggage trailers.

CRABTREE AND CO., LTD., J. A.—See under "Electrical."

CULLUM AND CO., LTD., HORACE W., 8/9 Flowers Mews, London, N.19 (Archway 2662-5).—Silencing for hangar-type and dynamometer-type test houses; intake splitters for jet test-beds. Acoustic ceilings and wall linings; soundproofing, including doors, windows, etc. Acoustic-Celotex ceilings. Associated company: Detuners, Ltd.

CURRAN, LTD., JOHN, Curran Road, Cardiff (Cardiff 20641; Works, 44431).—Test equipment for turbojet, turboprop and piston engines. Turning gears for radar installations. General and aeronautical engineers. **S.B.A.C. Stand 70.**

DECCA NAVIGATOR CO., LTD.,—See under "Electrical."

DESOUTTER BROTHERS, LTD., The Hyde, Edgware Road, London, N.W.9 (Colindale 6346).—Portable pneumatic and electric straight drills, corner drills, screwdrivers and nut-runners, shears, nibblers and grinders. **S.B.A.C. Stand 95.**

DETUNERS LIMITED, 8/9 Flowers Mews, London, N.19 (Archway 2662-5).—Cullum Detuners for jet test-bed silencing. Mk V and small Mk V for dry running; Mk VI for reheat. Associated company: Horace W. Cullum and Co., Ltd.

DEXION, LTD., Triumph House, 189 Regent Street, London W.1 (Regent 4841).—Dexion slotted angle and accessories: maintenance platforms; racks; storage equipment, etc.

DOCKER BROTHERS.—See under "Paints and Finishes."

DRAGONAIR, LTD.—See under "Cabin Equipment."

DUNDAS, LTD., R. K.—See under "Miscellaneous."

EKCO ELECTRONICS, LTD.—See under "Electrical."

ELECTRICAL ENGINEERING CONSTRUCTION CO., LTD., Seymour Wharf, Totnes, Devon (Totnes 3282).—Aircraft starting and servicing units, all types, self-propelled and trailer.

ENFIELD ROLLING MILLS, LTD., Brimsdown, Enfield, Middlesex (Howard 1255).—Spot and seam welding electrodes for resistance welding of aluminium alloys, stainless steels and nimonic alloys. Electrode holders, flash-welding dies.

ENGLISH ELECTRIC CO., LTD., Kingsway, London, W.C.2 (Holborn 6966).—Test-plant equipment. (See also under aircraft review section in this issue). **S.B.A.C. Stands Q and 132.**

ENGLISH NUMBERING MACHINES, LTD., Queensway, Enfield, Middlesex (Howard 2611).—Precision counting devices; special alloy wheels and pinions for mechanisms of aircraft instruments, etc.

ENGLISH STEEL CORPORATION, LTD.—See under "Materials."

ESAVIAN, LTD., Esavian Works, Stevenage, Herts (Stevenage 500).—Manufacturers of large folding and sliding hangar doors in aluminium, and of folding and sliding doors of smaller sizes in wood.

EVERSHED AND VIGNOLES, LTD.—See under "Aircraft Parts."

EXACTOR, LTD. — See under "Aircraft Parts."

FAIRTHORPE, LTD.—See under "Aircraft Parts."

FEENY AND JOHNSON, LTD.—See under "Aircraft Parts."

FELTHAM AND SONS, LTD., WALTER. — See under "Miscellaneous."

FENNER AND CO., LTD.—See under "Aircraft Parts."

FERRO ENAMELS, LTD.—See under "Paints and Finishes."

FIELDING AND PLATT, LTD., Atlas Works, Gloucester (Gloucester 20351).—Designers and manufacturers of hydraulically operated presses, machines and ancillary equipment for the aeronautical, automobile, electrical and general engineering industries.

FIRESTONE TYRE AND RUBBER CO., LTD.—See under "Aircraft Parts."

FIRTH BROWN TOOLS, LTD., Speedicut Works, Carlisle Street East, Sheffield, 4 (Sheffield 27151).—Manufacturers of engineers' cutting tools of all types: drills, reamers, cutters, screw-thread tools, carbide tools, saws, woodworking tools, etc.

FLEXIBLE DRIVES (GILMANS), LTD., 195 High Street, Smethwick, 41 (Smethwick 1202). — Flexible-drive machines and accessories for surface scaling, sanding, grinding, milling and filling; rotary milling cutters, files and rasps. **S.B.A.C. Stand 66**

FLIGHT REFUELLING, LTD.—See under "Fuels and Lubricants."

FOX AND SONS (AVIATION), LTD., C. J.—See under "Miscellaneous."

G.M. ENGINEERING (OTTERY ST. MARY), LTD., 1, Victoria Street, London, S.W.1 (Abbey 5095).—Busbar trunking and associated switchgear for distributing electric power in repair hangars and machine shops.

GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2 (Temple Bar 8000).—Airport approach, runway and taxiway lighting; aircraft galley equipment; G.E.C. heavy alloy; Pren and P.G.C.A. lightweight aircraft cables. **S.B.A.C. Stand 108.**

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GODFREY AND PARTNERS, LTD., SIR GEORGE.—See under "Aircraft Parts."

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GUIDE BRIDGE RUBBER CO., LTD.—See under "Miscellaneous."

HALL AND PICKLES, LTD.—See under "Factory and Airfield Equipment."

HARLEY AIRCRAFT LANDING LAMPS.—See under "Electrical."

HEADLAND, LTD., THOS. P.—See under "Aircraft Parts."

HEENAN AND FROUDE, LTD., Worcester (Worcester 3391/5).—Aircraft engine test-plant, including Froude hydraulic dynamometers, Heenan-Dynamatic dynamometers, Heenan jet-engine test plants, wind-tunnel test plants, hangar stands, etc.

HENLEY'S, LTD.,—See under "Miscellaneous."

HESTON AIRCRAFT CO., LTD.—See under "Aircraft Parts."

HIGH-PRESSURE COMPONENTS, LTD.—See under "Aircraft Parts."

HOLOPHANE, LTD., Elverton Street, London, S.W.1 (Victoria 8062).—Airfield and runway lighting equipment; hangar lighting units.

HOOVER, LTD., Perivale Middlesex (Perivale 3311). — Electric cleaners, washing machines, polishers and "Glassmaster" glass-washing device for civil and service aircraft establishments and catering; fractional horsepower electric motors for a wide range of industrial use, ventilation and refrigeration; commutators and switchgear.

HORDERN-RICHMOND, LTD.—See under "Materials."

HOUCHIN, LTD., Garford Street, London, E.14 (East 4123).—Makers of airfield ground-starter equipment and industrial mobile generating plant.

HUDES MERCHANDISING CORPORATION, LTD. — See under "Miscellaneous."

HYMATIC ENGINEERING CO., LTD.—See under "Aircraft Parts."

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KING, LTD., GEO. W., Argyle Works, Stevenage, Herts (Stevenage 440).—Mechanical-handling equipment for the aircraft industry: Overhead cranes and runways, overhead and floor conveyors, electric and hand chain pulley blocks.

LEYTONSTONE JIG AND TOOL CO., LTD., Leytool Works, High Road, Leyton, London, E.10 (Leytonstone 5022). — Designers and manufacturers of precision tooling equipment. Aircraft components and assemblies. High-quality hand and service tools.

LINCOLN ELECTRIC CO., LTD., Welwyn Garden City, Herts (Welwyn Garden 920).—Manufacturers of ground power units for starting and servicing turbojet and turboprop aircraft.

LLEWELLYN RYLAND, LTD.—See under "Paints and Finishes."

LODGE PLUGS, LTD.—See under "Electrical."

M.H.H. ENGINEERING CO., LTD.—See under "Electrical."

M.L. AVIATION CO., LTD.—See under "Military Aircraft Special Equipment."

MALLOCK-ARMSTRONG CO., 204 High Street, Guildford, Surrey (Guildford 66488).—Suppliers of ear defenders to the aircraft industry: The "Nosonic" head-set, specially developed for the protection of test-bed personnel.

MANCHESTER OIL REFINERY (SALES), LTD.—See under "Fuels and Lubricants."

MARCONI INSTRUMENTS, LTD., St. Albans, Hertfordshire (St. Albans 6161-7). — Telecommunications measurement equipment, industrial X-ray and electronic instruments.

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MERCURY TRUCK AND TRACTOR CO., LTD., Northgate House, London Road, Gloucester (Gloucester 22025).—"Mercury" diesel and petrol engined trucks and tractors for towing aircraft, baggage trailers and ground equipment.

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THE AIRCRAFT INDUSTRY . . .

Factory and Airfield Equipment (Continued)

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MULLARD, LTD. — See under "Electrical."

MUREX WELDING PROCESSES, LTD., Waltham Cross, Herts (Waltham Cross 3636).—Engine-driven ground power units for servicing and starting all types of aircraft, including the latest jet types. **S.B.A.C. Stand 127.**

NEGRETTI AND ZAMBRA, LTD.—See under "Aircraft Instruments."

NEWMAN INDUSTRIES, LTD. —See under "Electrical."

NEW WELBECK, LTD., 94 New Bedford Road, Luton, Beds (Luton 3895).—Commercial and industrial vacuum cleaners, specially suitable for the industry, and as used by many leading aircraft constructors.

NORGREN, LTD., C. A., Shipston-on-Stour, Warwickshire (Shipston-on-Stour 110).—Compressed air-line equipment, including filters, pressure regulators, oil-fog and micro-fog lubricators, and air purifiers.

NORTHERN ALUMINIUM CO., LTD.—See under "Materials."

OMES, LTD. — See under "Materials."

OPTICAL MEASURING TOOLS, LTD., 142 Bridge Road, Maidenhead, Berks (Maidenhead 3704).—Optical measuring instruments for the engineering industries. **S.B.A.C. Stand 192.**

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PETBOW, LTD., Richborough Works, Sandwich, Kent (Sandwich 3218-9).—Dual-voltage ground power units, peak output 120kW. Generating plant, 1 to 175 KVA. Welding plant, 150 to 600 amp (diesel and transformer).

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PRECISION COMPONENTS (BARNET), LTD.).—See under "Electrical."

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PUREFOY UNIT TOOLING, LTD., J. B., Upper Tilt Works, Cobham, Surrey (Cobham, Surrey 3013).—Standard parts comprising of a range of over 700 items to speed up the design and manufacture of jigs and fixtures.

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ROSS, LTD., S. GRAHAME, 50-51, Beauchamp Place, London, S.W.3 (Kensington 0126).—Airfield and marine-base equipment. **S.B.A.C. Stand 68.**

ROZALEX, LTD., 10, Norfolk Street, Manchester, 2 (Blackfriars 1122).—Rozalex barrier creams, for protecting the skin against industrial irritants and occupational dermatitis. Technical advice available.

RUBERY, OWEN AND CO., LTD. —See under "Aircraft Parts."

S.M.D. ENGINEERS, LTD., Buckingham Avenue, Slough, Bucks (Slough 23212).—Aluminium industrial buildings, including hangars, nosedocks, etc., engineering structures in aluminium.

SALFORD ELECTRICAL INSTRUMENTS, LTD.—See under "Aircraft Instruments."

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SARO LAMINATED WOOD PRODUCTS, LTD. — See under "Materials."

SAUNDERS VALVE CO., LTD.— See under "Aircraft Parts."

SAVAGE AND PARSONS, LTD., Watford By-Pass, Watford, Herts (Watford 6071).—Static and dynamic stress-analysis recording and plotting equipment (ground and airborne). Projection equipment, magnetic recording devices, radar scanners and aerials. **S.B.A.C. Stand 164.**

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SCIAKY ELECTRIC WELDING MACHINES, LTD., Farnham Road, Slough, Bucks (Slough 25551).—Manufacturers of aircraft resistance-welding plant, meeting high-speed jet and rocket structural requirements: stored-energy and modulated-wave welders for light alloys and heat-resisting steels of gauges from 24 s.w.g. to 0.250in. **S.B.A.C. Stand 73.**

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SERCK RADIATORS, LTD.—See under "Aircraft Parts."

SHORT AND MASON, LTD., Hale End Road, Walthamstow, London, E.17 (Larkswood 3371).—Meteorological instruments; wind speed and direction indicators for airfield use.

SIEBE, GORMAN AND CO., LTD.—See under "Military Aircraft Special Equipment."

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SIMON EQUIPMENT, LTD., 48-50 George Street, London, W.1 (Welbeck 2371).—Designers and manufacturers of long-duration monitoring equipment (mechanical embossing, magnetic, etc.) for airport and general security purposes.

SKYHI, LTD., Worton Road, Isleworth, Middlesex (Hounslow 2211).—Main wing and wheel-change jacks; aircraft salvage equipment; "Skyflex" high-pressure hoses. **S.B.A.C. Stand 28.**

SMITHS OF STOCKPORT, LTD., Wellington Road South, Stockport (Stockport 4642).—Manufacturers of ground and airborne equipment: engineering, cable splicing, woodwork and machining.

STREAM-LINE FILTERS, LTD. —See under "Fuels and Lubricants."

SUNDSTRAND SANDERS, LTD., Shipston-on-Stour, Warwickshire (Shipston-on-Stour 110).—Pneumatic sanding machines with vibrationless, straight-line motion for undertaking "rubbing down" of all types of surfaces, both flat and curved.

SURREY CONCRETE, LTD., Peasmarsh, Guildford (Guildford 62986-7).—Manufacturers of precast concrete buildings from 6ft to 40ft span, for garages, workshops, offices and canteens.

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TELEFLEX PRODUCTS, LTD.— See under "Aircraft Parts."

TERRY AND SONS, LTD., HERBERT.—See under "Aircraft Parts."

TEST EQUIPMENT, LTD., Crompton Way, Crawley, Sussex (Crawley 1161/1162. — Designers and manufacturers of gyroscopic instruments and research equipment, wind-tunnel balances, manometers, high- and low-speed models, and all types of wind tunnel ancillary equipment.

THOMPSON BROS. (BILSTON), LTD.—See under "Fuels and Lubricants."

TITANINE, LTD. — See under "Paints and Finishes."

TREVOR - JOHNSTONE CO., LTD., 14 Berkeley Street, Piccadilly, London, W.1 (Grosvenor 3871).—Manufacturers of the R.V.A. continuous long-playing airport magnetic recorder. Producers of the "Ultrasonel" metallurgical flaw-detector equipment.

TRIST AND CO., LTD., RONALD —See under "Aircraft Parts."

TUFNOL, LTD.—See under "Aircraft Parts."

VAN MOPPES AND SONS (DIAMOND TOOLS), LTD., L. M., Basingstoke, Hampshire.—Manufacturers of diamond tools and graded diamond powders. Suppliers of industrial diamonds, the Diaform wheel forming attachment and the Diatuf blade-root grinding wheel roughing tool.

VERNONS INDUSTRIES, LTD., Valley Road, Bidston, Birkenhead (Birkenhead 6416). — A.I.D. and A.R.B. approved manufacturers of airport ground equipment.

VOKES, LTD.—See under "Aircraft Parts."

VOSPER, LTD.—See under "Miscellaneous."

WEST AND PARTNERS LTD., A., 36 Broadway, Westminster, London, S.W.1 (Abbey 3323).—Complete drawing-office equipment; instruments; materials; "Uno" pen stencils; photo-copies; sensitized materials.

WESTINGHOUSE BRAKE AND SIGNAL CO., LTD.—See under "Electrical."

WICKMAN, LTD., Coventry (Tile Hill 66271).—Manufacturers of multi-spindle and other precision and high-production machine tools and of Wimet cemented carbide tools and wear-resistant parts. Agents for English, American and Continental machines.

WILLIAMS AND JAMES (ENGINEERS), LTD.—See under "Aircraft Parts."

WOLF ELECTRIC TOOLS, LTD., Pioneer Works, Fanger Lane, London, W.5 (Perivale 5631-4).—Portable electric tools, and transport service equipment.

ZWICKY, LTD.—See under **"Fuels** and Lubricants."

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AEROCONTACTS, LTD., Gatwick Airport, Horley, Surrey (Horley 1510).—The SCOBA range of A.R.B./A.I.D. approved products, covering every type of aircraft radio, electrical, general equipment, components, accessories, instruments, A.G.S. parts. **S.B.A.C. Stand 65.**

AERONAUTICAL RADIO SERVICES, LTD., Blackbushe Airport, nr. Camberley, Surrey (Camberley 1600. Ext. 239).—A.I.D. and A.R.B. approved for maintenance and overhaul of aircraft radio and radar equipment. Consultants and stockists.

AEROSERVICES (LONDON) LTD., Croydon Airport, Surrey (**Croydon 8833**).—Suppliers of aircraft, aero engines and spare parts. Brokers and consultants.

AIR SERVICE TRAINING, LTD., Hamble, Southampton (Hamble 2181).—Training Division: Flying, navigation, engineering and radio training. (See also under "Aircraft Parts.") **S.B.A.C. Stand O.**

AIRSPEED PRECISION (LONDON), LTD., 22 Bruton street, London, W.1 (Mayfair 9996/7).—Design and development; complete photographic service; precision engineering; steel and stainless steel tube manufacturers.

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AIRWORK GENERAL TRADING CO., LTD., 15 Chesterfield Street, London, W.1 (Grosvenor 4841).—Repair, maintenance and modification of aircraft to customers' specification; radio equipment and servicing; aircraft, engine and electronic-equipment sales. **S.B.A.C. Stand 196.**

ANTICOUSTIC CO., 204, High Street, Guildford, Surrey (Guildford 66488).— Sound-insulation materials and equipment. Manufacturers of "Mallock - Armstrong" and "Nosonic," ear defenders (see "Mallock-Armstrong" under "Factory and Airfield Equipment"). Low-pressure plastics mouldings and laminated components.

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AVIATION TRADERS, LTD., 15, Great Cumberland Place, W.1 (Ambassador 2091) (see Aviation Traders (Eng.), Ltd., for addresses of bases). —Sale of aircraft, components and accessories; consultants; insurance.

AVIGATION, LTD., 30, Central Chambers, London, W.5 (Ealing 8949).—Postal and direct tuition for all pilot/navigator licences. Eight-colour illustrated lecture notes. Link training division and general printing department. Flying arranged.

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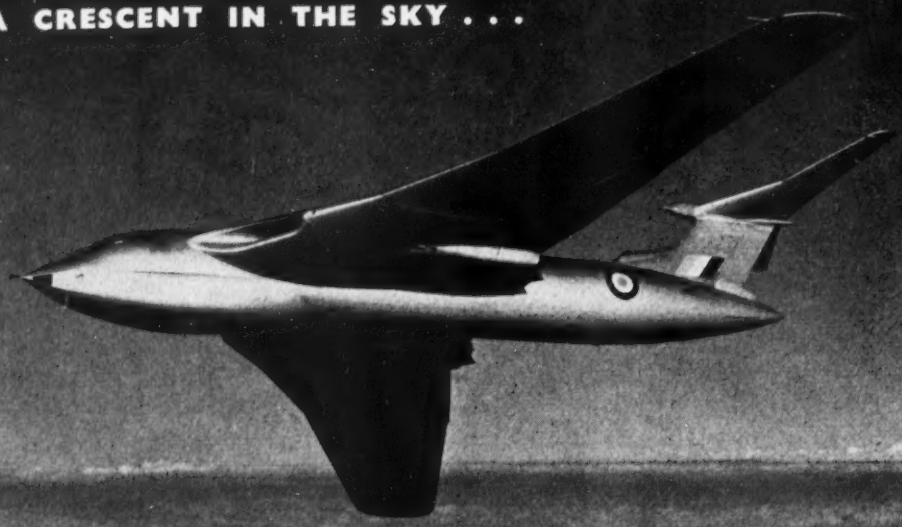

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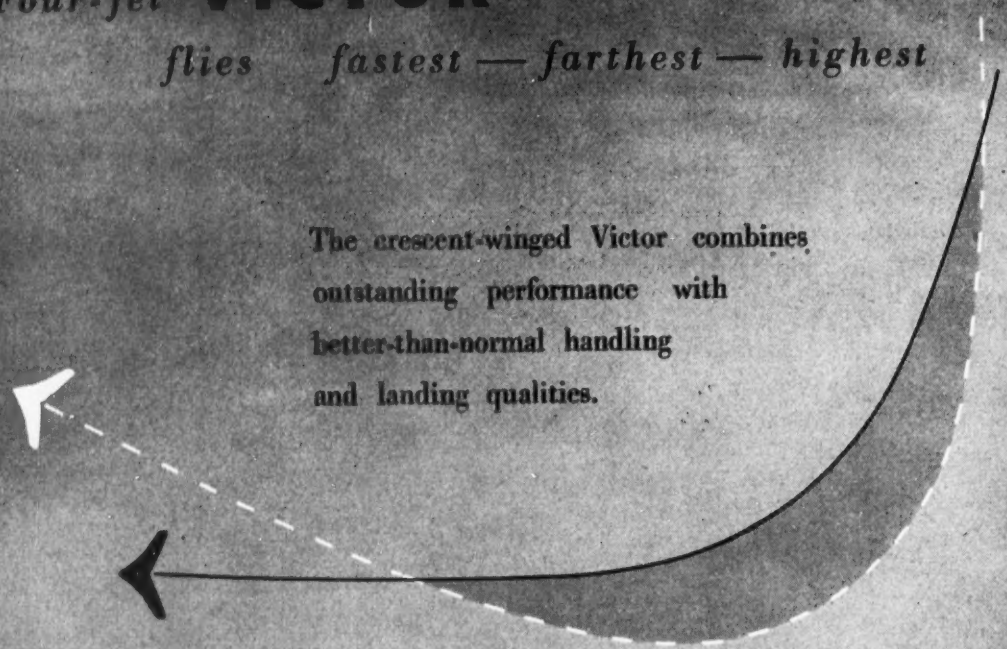

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THE AIRCRAFT INDUSTRY . . .

Miscellaneous (Continued)

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BRITISH AVIATION INSURANCE CO., LTD., 3-4 Lime Street, London, E.C.3 (Mansion House 0444).— Aviation insurance. Air Safety and Survey Division: Basildon House, Moorgate, London, E.C.2 (Monarch 4764).

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, Shakespeare House, 17-19 Stratford Place, London, W.1 (Mayfair 0812). Postal tuition for all branches of aeronautical engineering and professional aeronautical examinations.

BRITISH TRANSFER PRINTING CO., LTD., Harefield Road, Coventry (Coventry 64021).—Transfers for marking aircraft, charter and company badges, R.A.F. and Commonwealth crests, Union Jacks, Royal Airmail crests.

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C. AND S. AIRCRAFT (Components and Spares (Aircraft), Ltd.)., Blackbushe Airport, Camberley, Surrey (Camberley 1600, Extns. 307-8). —A.R.B. approved. Aircraft and engine sales, overhauls, magneto and carburetter spares, radio, instruments. Magnaflux crack detection.

CHEMRING, LTD., 62/4 Temple Chambers, Temple Avenue, London, E.C.4 (Central 8361). — Meteorological radar reflectors, for wind finding.

COLEY AND SON (HOUNSLOW), LTD., R. J.—See under "Materials."

COLLEGE OF AERONAUTICAL AND AUTOMOBILE ENGINEERING, Sydney street, Chelsea, London, S.W.3 (Flaxman 0021).— Comprehensive full-time technical and practical training for careers in all branches of aviation engineering.

DOWTY EQUIPMENT AUSTRALIA (PTY), LTD., Box 17, P.O., Bankstown, N.S.W., Australia.— Maintenance and servicing of aircraft equipment.

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EAGLE AIRCRAFT SERVICES, LTD., Blackbushe Airport, Camberley, Surrey (Yateley 3242).—A.R.B. and A.I.D. approved. Aircraft conversions, overhaul, maintenance; hydraulic, instrument and radio servicing facilities; Viking and Dakota parts stockists; aircraft consultants.

EXPORT PACKING SERVICE, LTD., 56 Kingsway, London, W.C.2 (Chancery 5121) and at Sittingbourne, Banbury, Merthyr Tydfil and Cardiff.—Scientific packers to industry and the Services, specializing in the packing of aircraft and aircraft components. **S.B.A.C. Stand 26.**

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FEENY AND JOHNSON, LTD.— See under "Aircraft Parts."

FIELD AIRCRAFT SERVICES, LTD., Croydon Airport, Surrey (Croydon 7777). — Comprehensive supply service: aircraft, engines, airscrews, instruments, radio, hydraulics; overhauls, repairs, modifications, conversions; transportation and ferrying.

FISHERS, 86/88 Wellington Street, Woolwich, London, S.E.18 (Woolwich 1055).—Naval, military and R.A.F. tailors and outfitters. Officers' uniforms for home and overseas service.

"FLIGHT" and "AIRCRAFT PRODUCTION"—Stand 195

FLIGHT REFUELLING, LTD.— See under "Fuels and Lubricants."

FLINT, LTD., HOWARD, Avery House, Avery Road, London, W.1 (Mayfair 3282).— Manufacturers of all types of flying clothing. **S.B.A.C. Stand 31.**

F.O.C. CARAVAN CENTRE, 200-220 Cricklewood Broadway, London, N.W.2 (Gladstone 2234).—Main distributors for leading holiday and residential caravans. Mobile offices and special-purpose trailers of all descriptions.

FOX AND SONS (AVIATION), LTD., C. J., 117 Victoria Street, London, S.W.1 (Victoria 0204).— Aircraft brokers; specialists in supply of Dakota and York spares. Sole agents for the Met-l-chek crack detection process.

GIEVES, LTD., 27 Old Bond Street, London, W.1 (Hyde Park 2276).— Uniform and flying clothes specialists. Uniforms and badges for airlines and clubs. Designs submitted.

GUIDE BRIDGE RUBBER CO., LTD., Vulcan Mill, Butcher Lane, Bury, Lancs (Bury 2216).—Manufacturers of meteorological, ceiling, pilot, sounding and high-altitude balloons.

HELICOPTER SALES (C.C.), LTD., Old Mill Road, Hunton Bridge, Herts (Kings Langley 2511). —U.K. dealers for Hiller Helicopters and dealers in second-hand helicopters of all makes.

HENLY'S, LTD., 385 Euston Road, London, N.W.1 (Euston 4444).—. Aviation department dealing exclusively with vehicle requirements of the aeronautical industry; mechanical-handling equipment.

HUDES MERCHANDISING CORPORATION, LTD., 52 Gloucester Place, London, W.1 (Welbeck 3521).—Swissair navigator (pocket computor); Nestler slide-rules and drawing equipment; Sartorius analytical balances; all metallurgical laboratory equipment.

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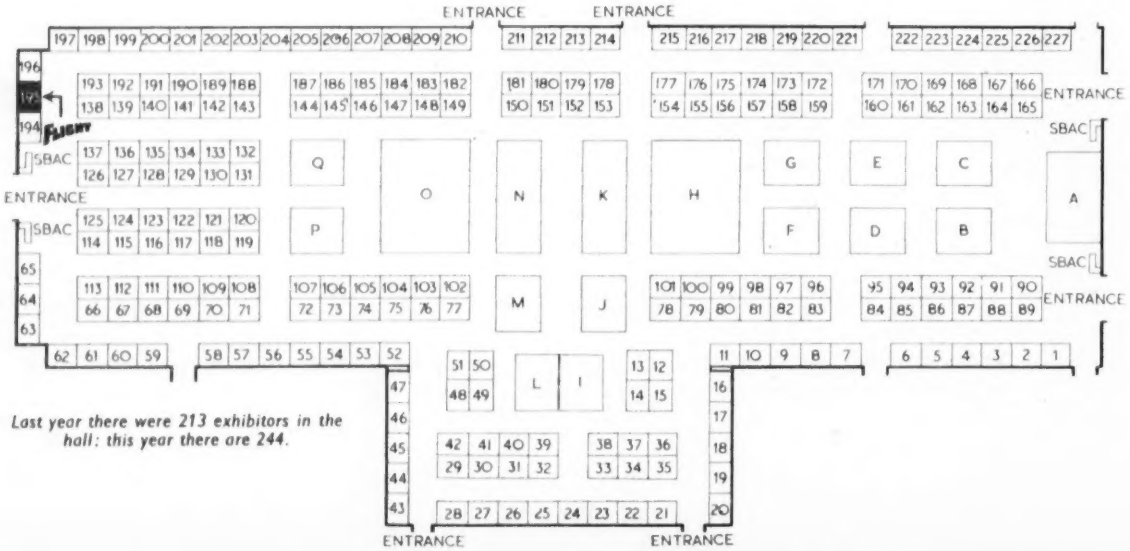

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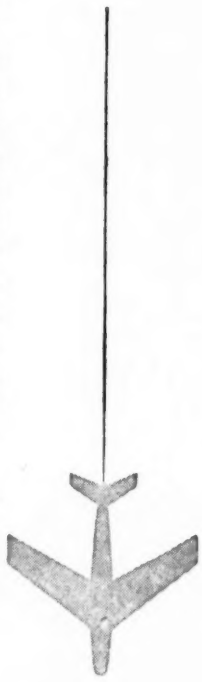

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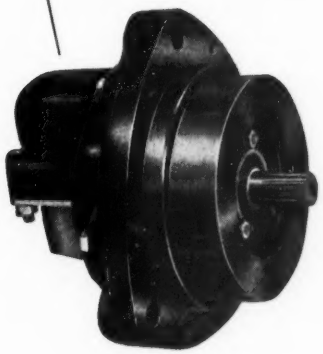

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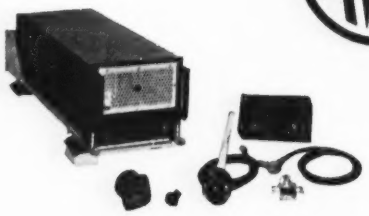

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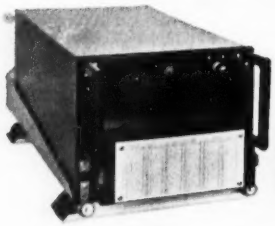

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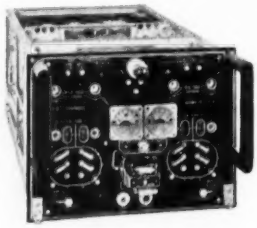

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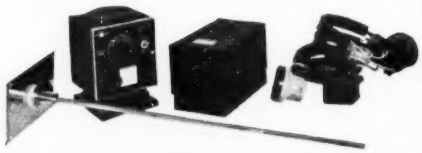

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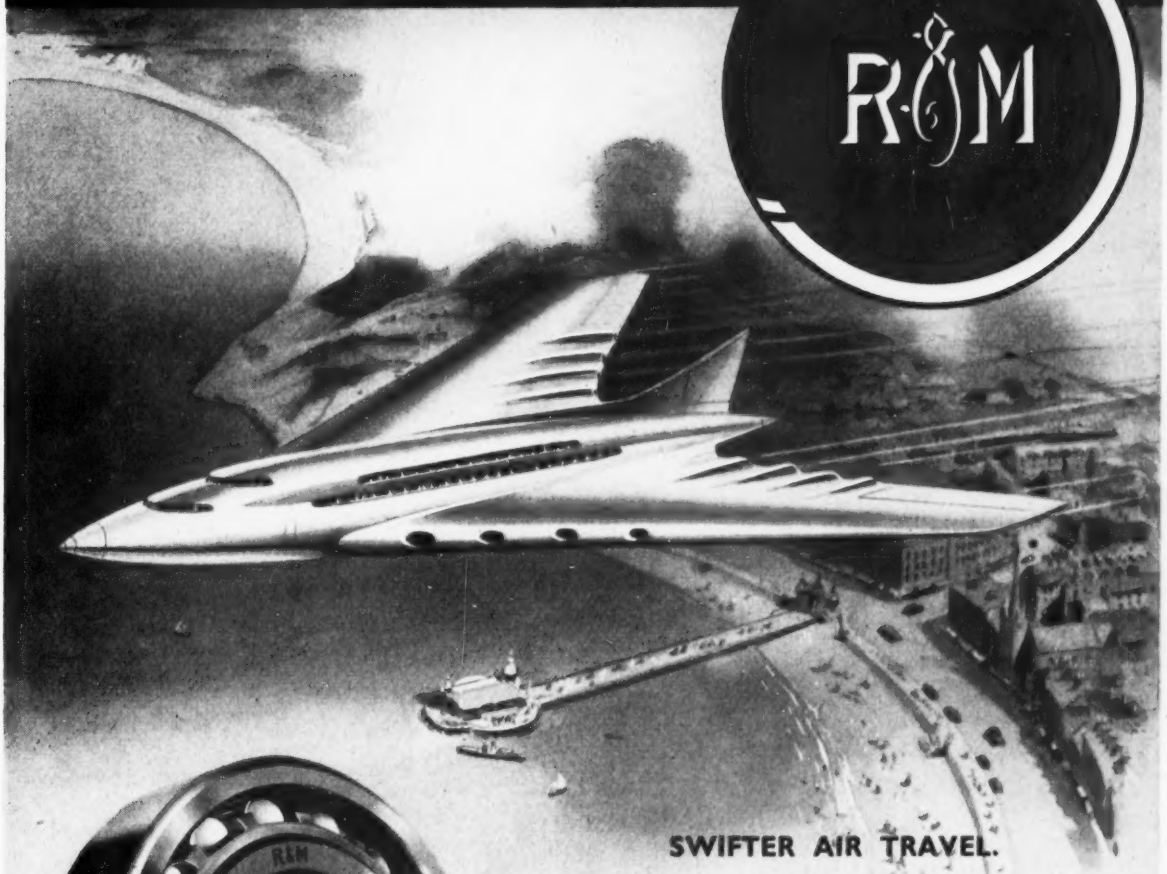

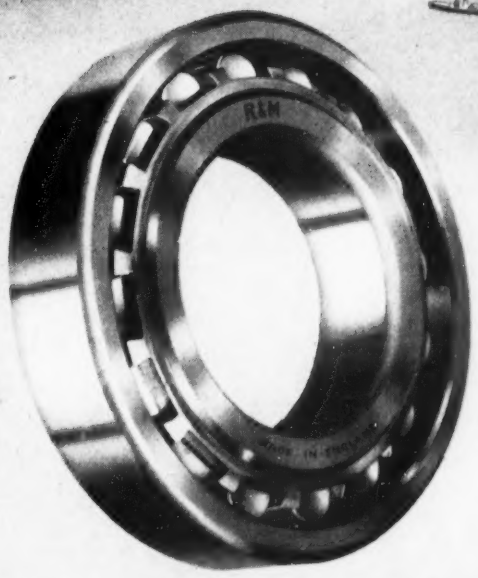

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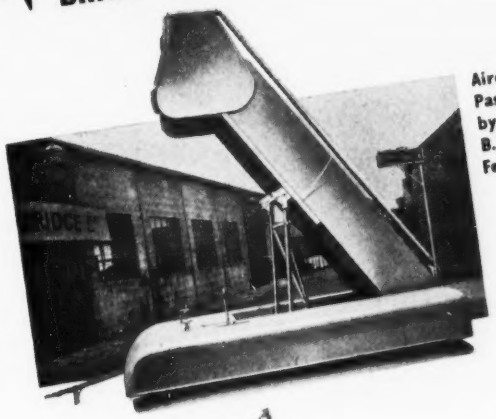
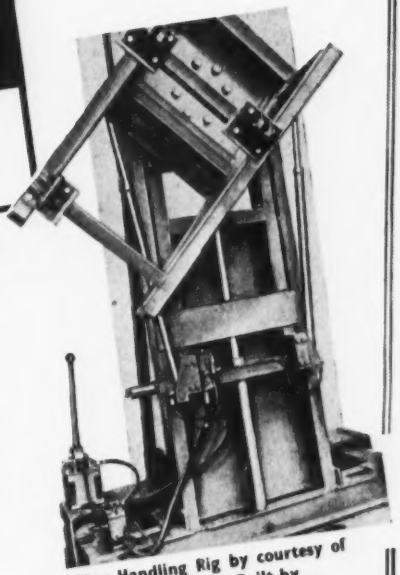


Aircraft Passenger Gangway by courtesy of B. F. Collingridge Ltd. Feltham, Middlesex



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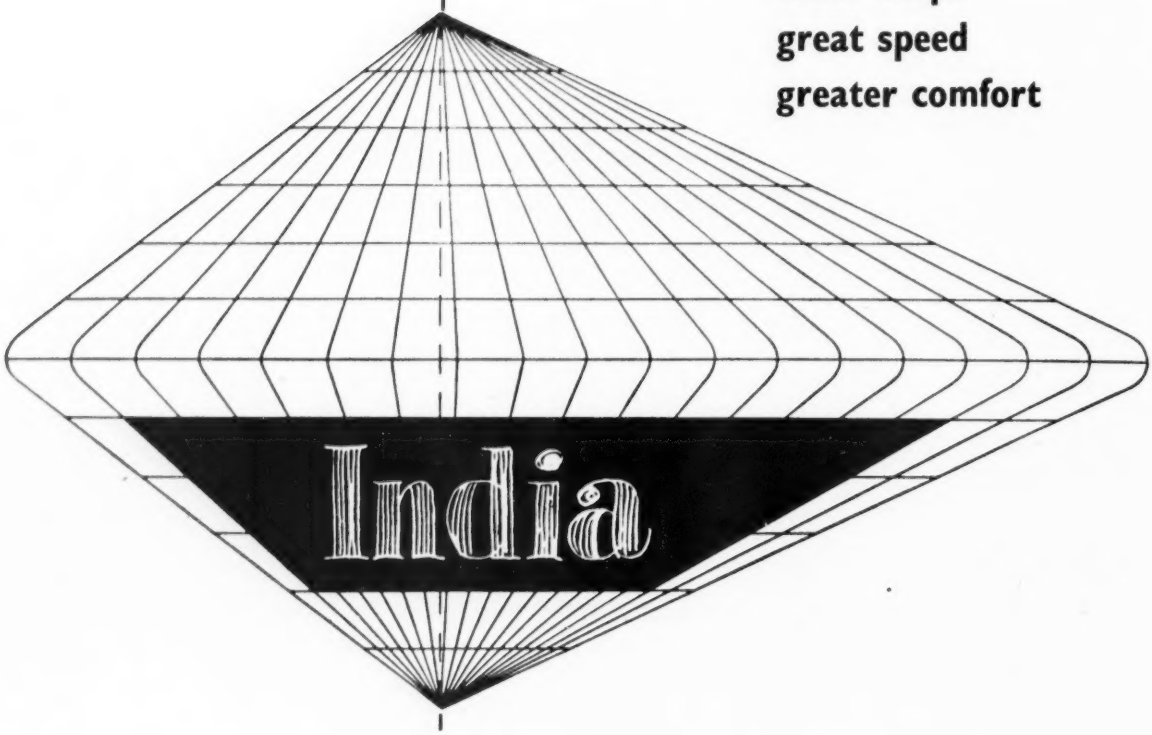

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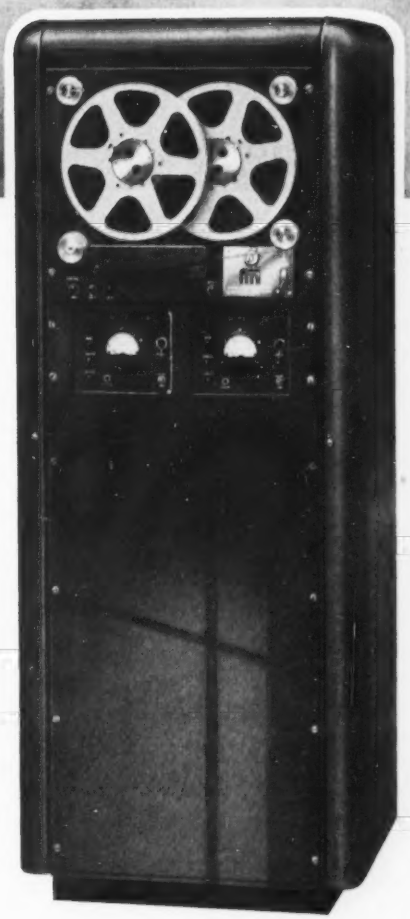

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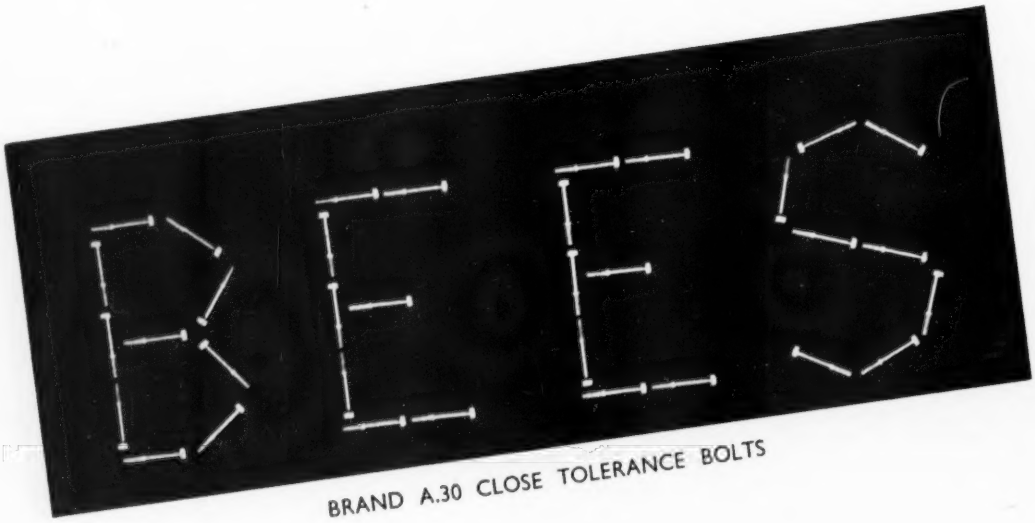

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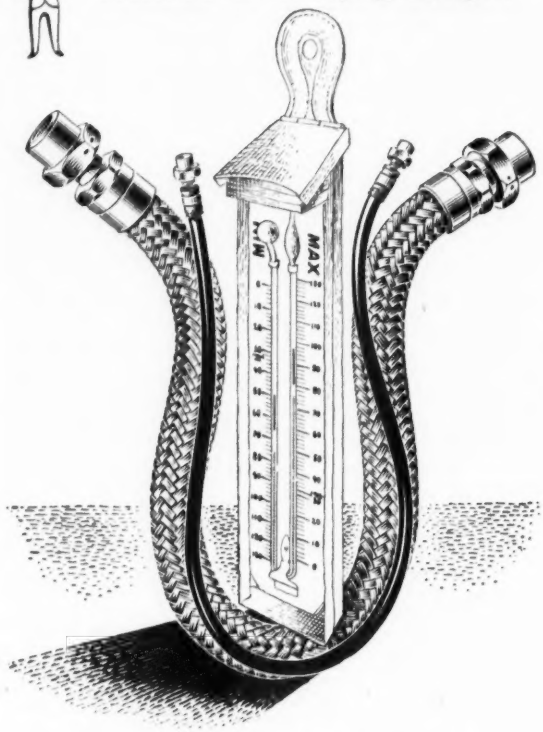

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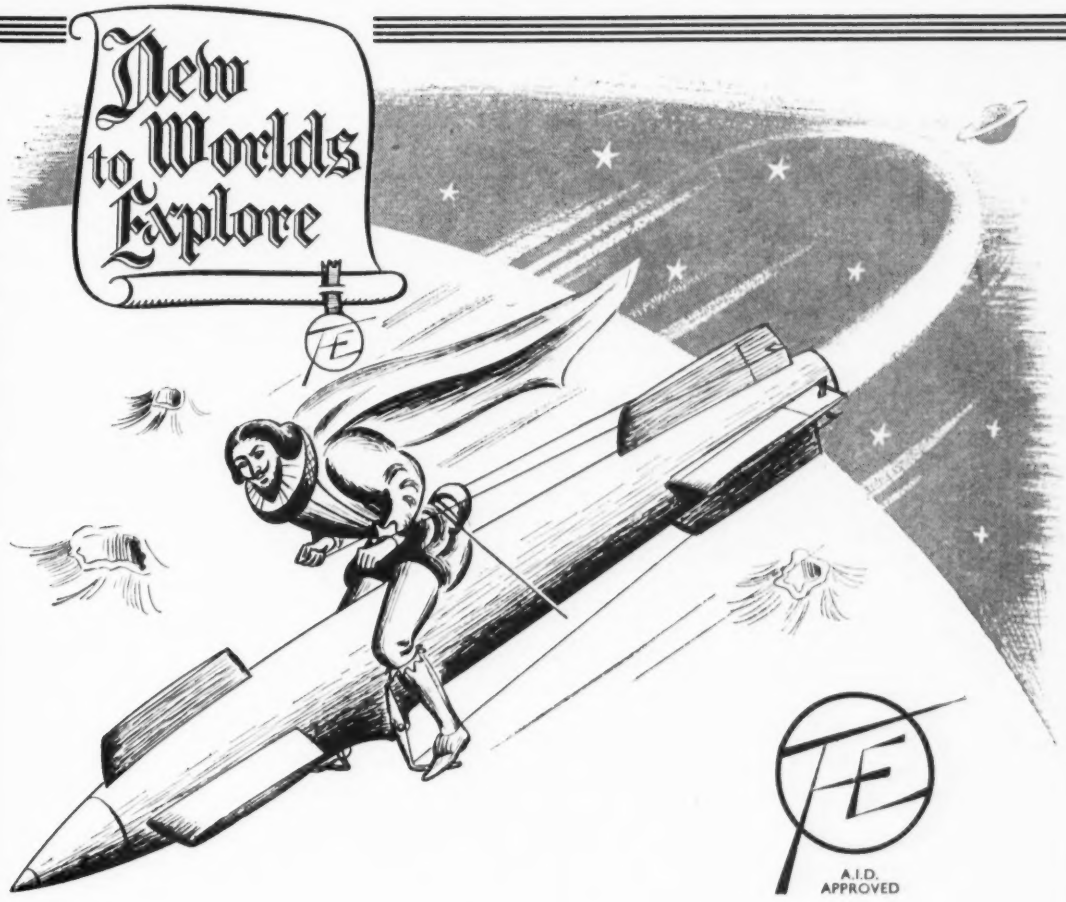

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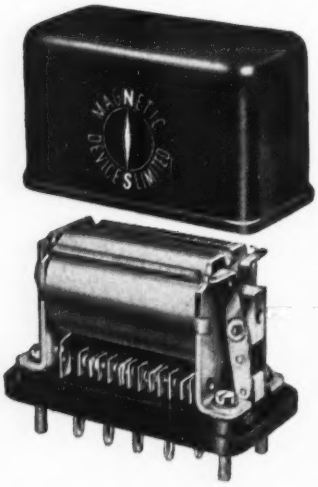

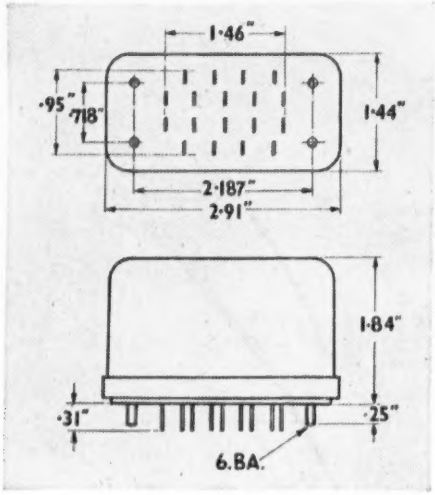

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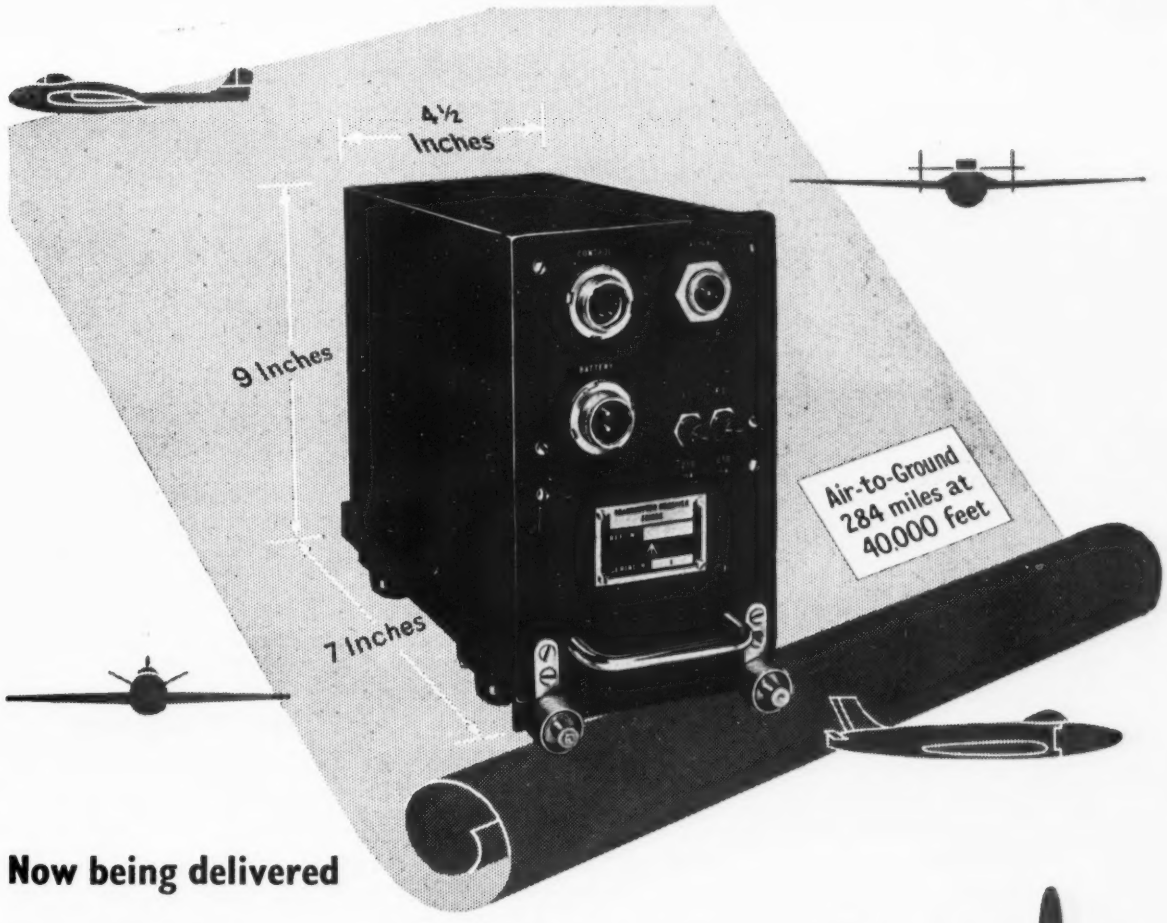

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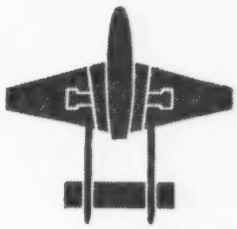

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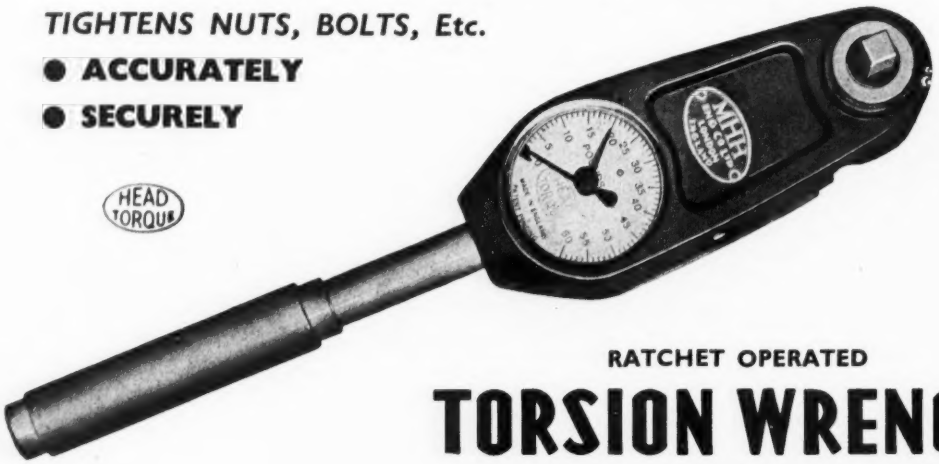

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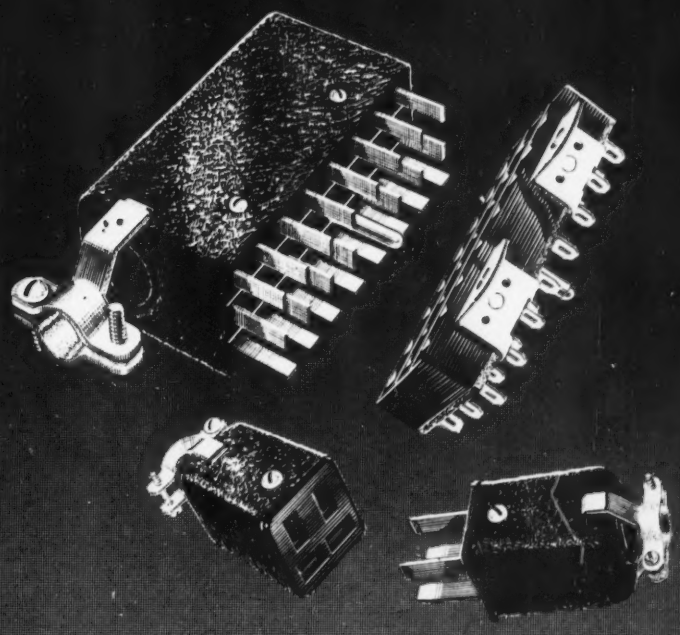

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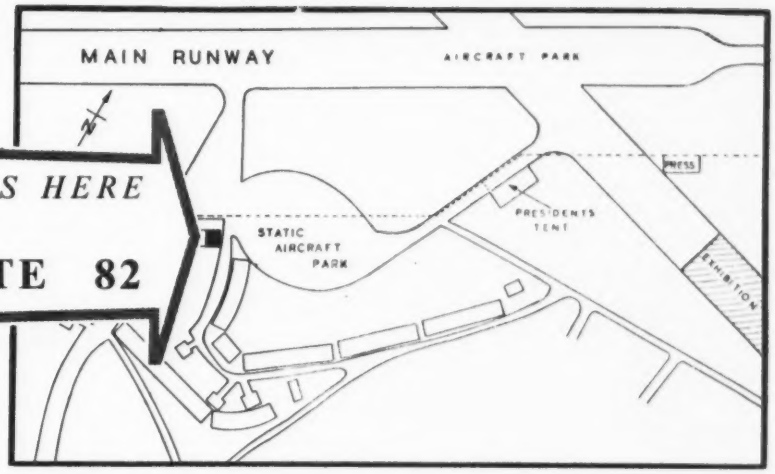

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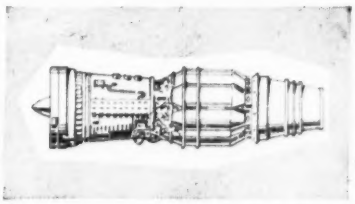

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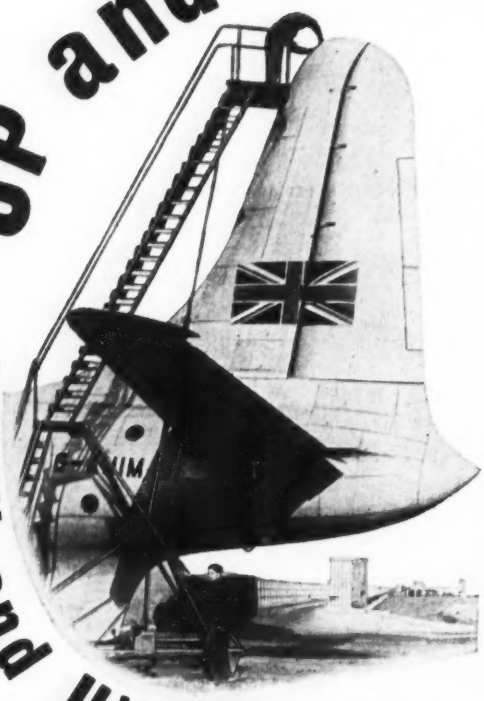

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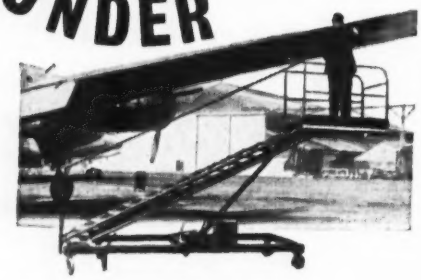

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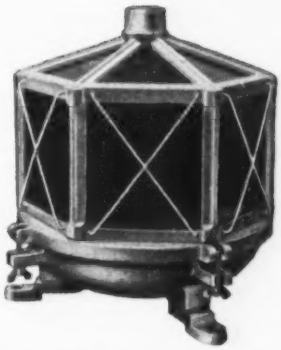

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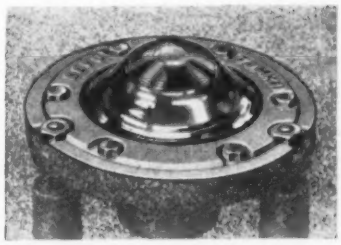

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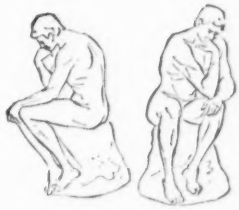

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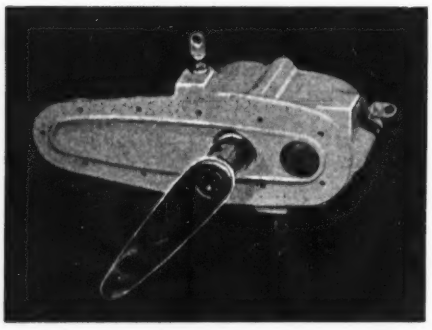

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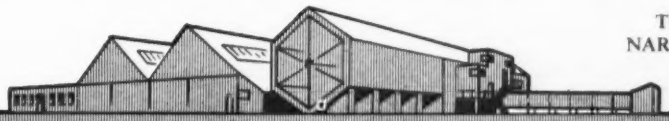

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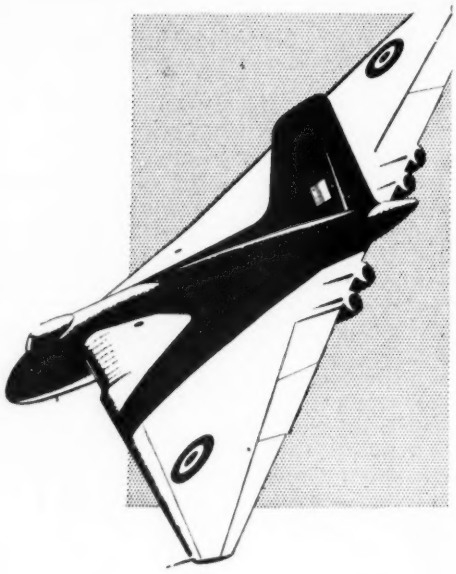

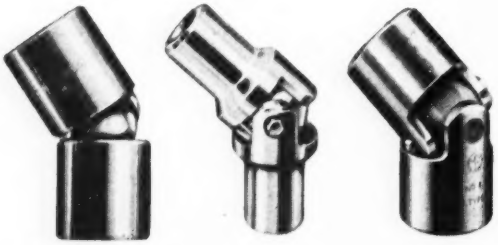

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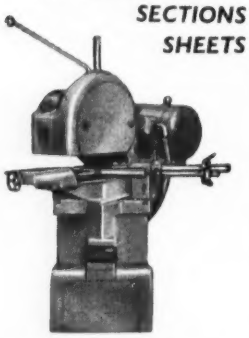

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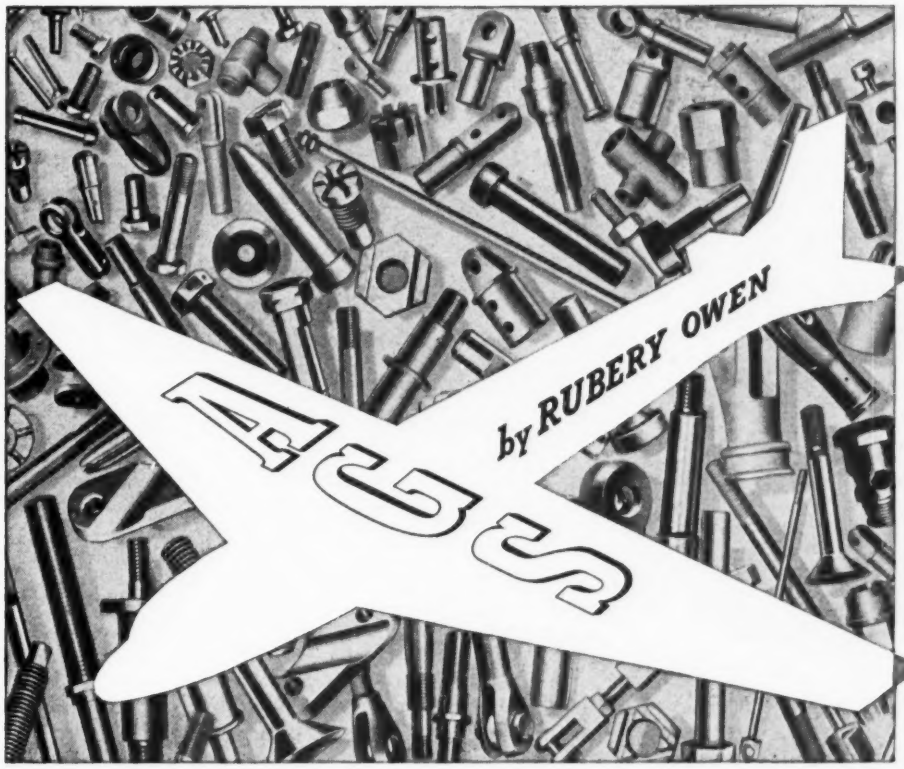

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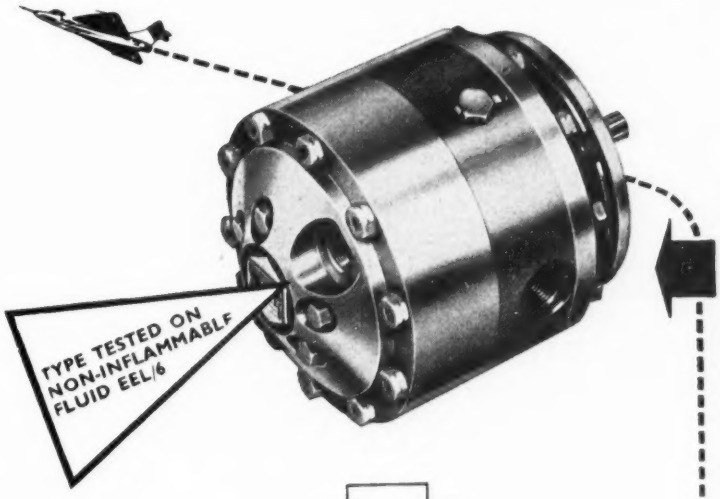

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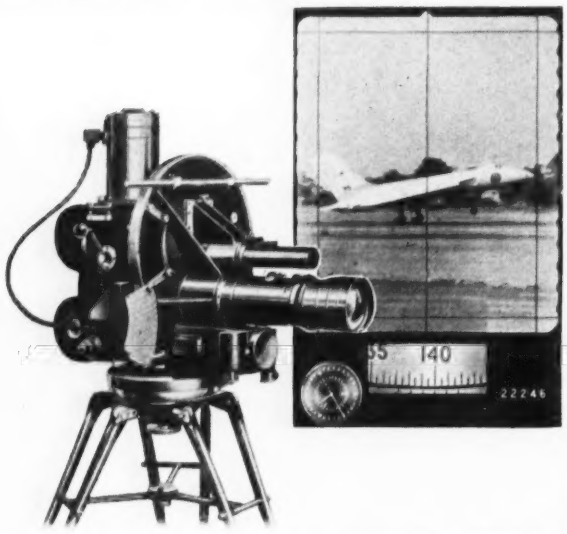
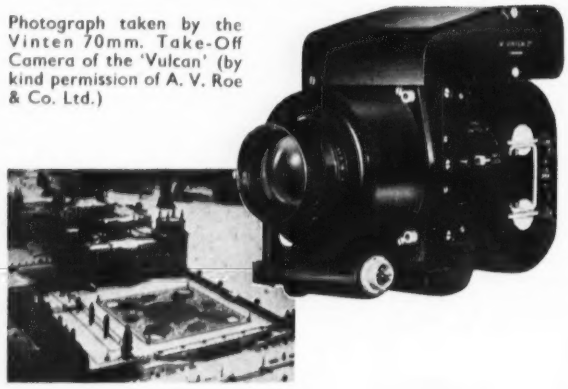


Photograph taken by the Vinten 70mm. Take-Off Camera of the 'Vulcan' (by kind permission of A. V. Roe & Co. Ltd.)



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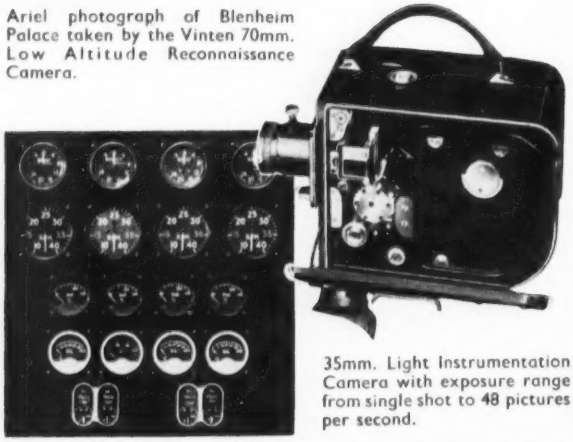

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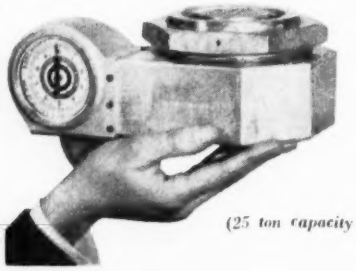

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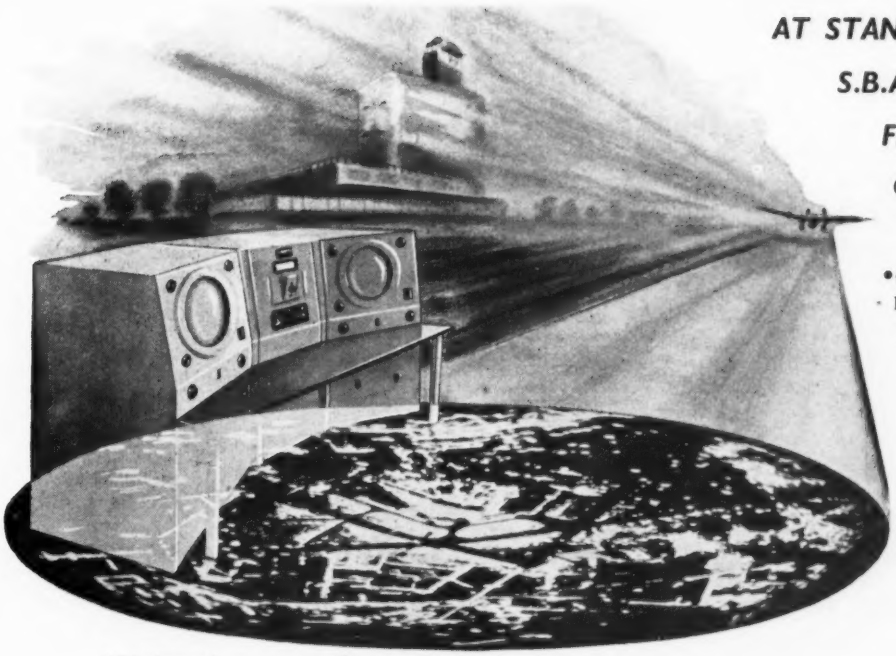

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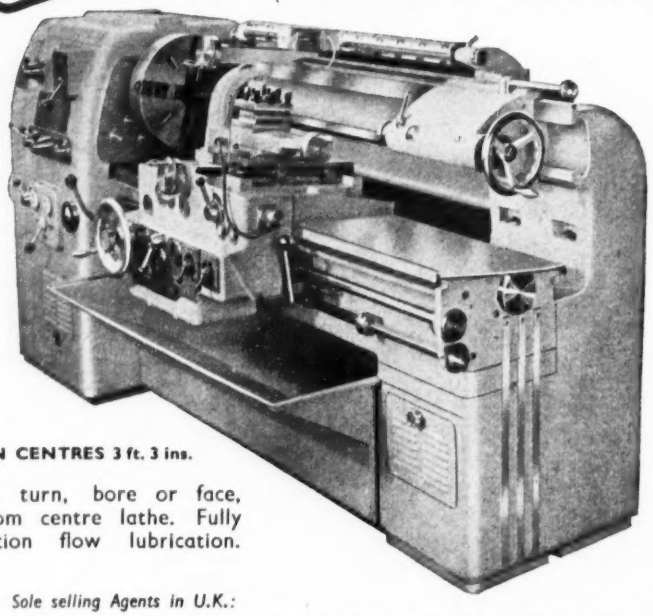

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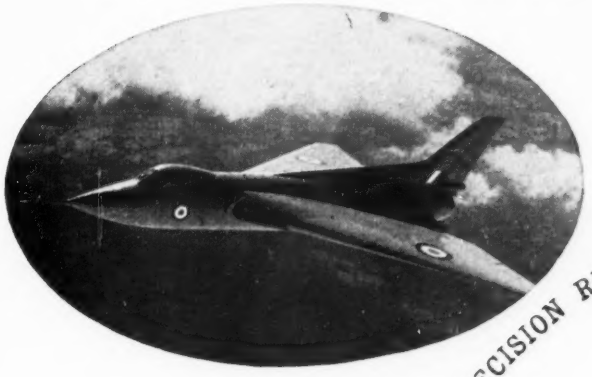

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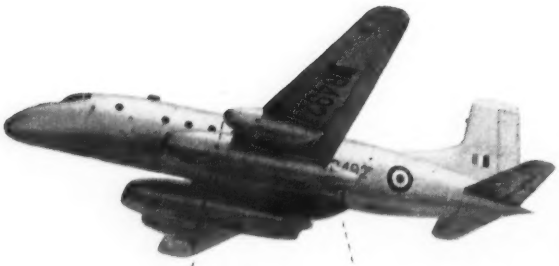

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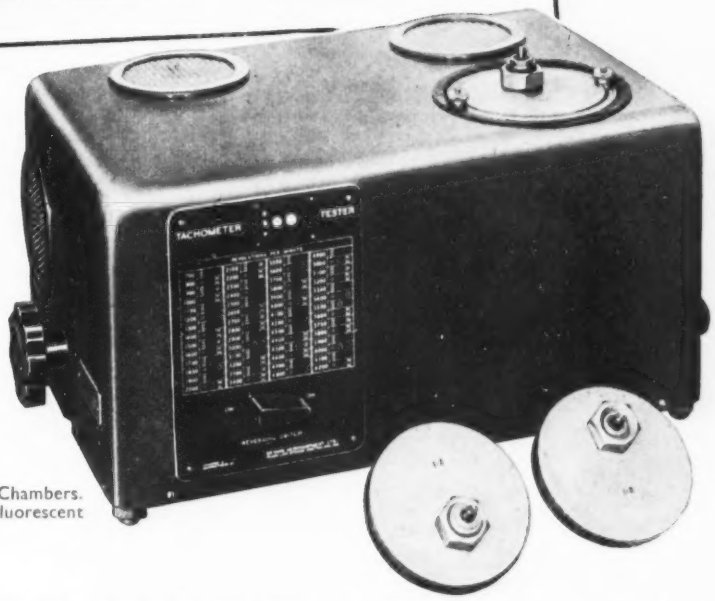

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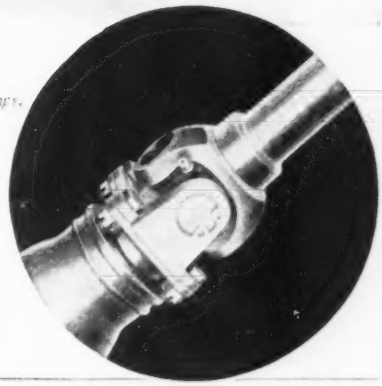

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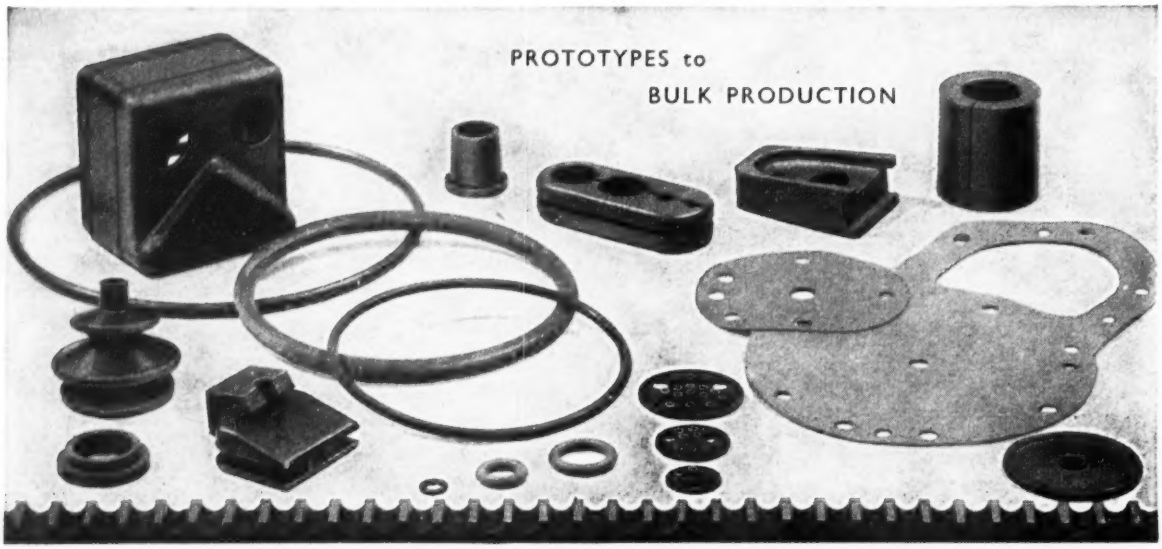

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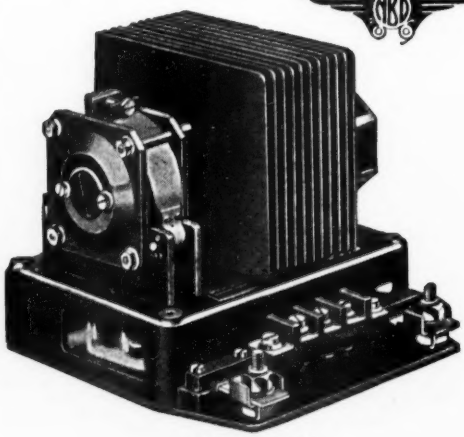

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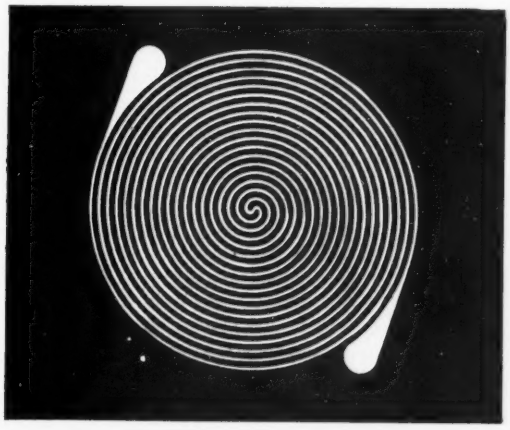

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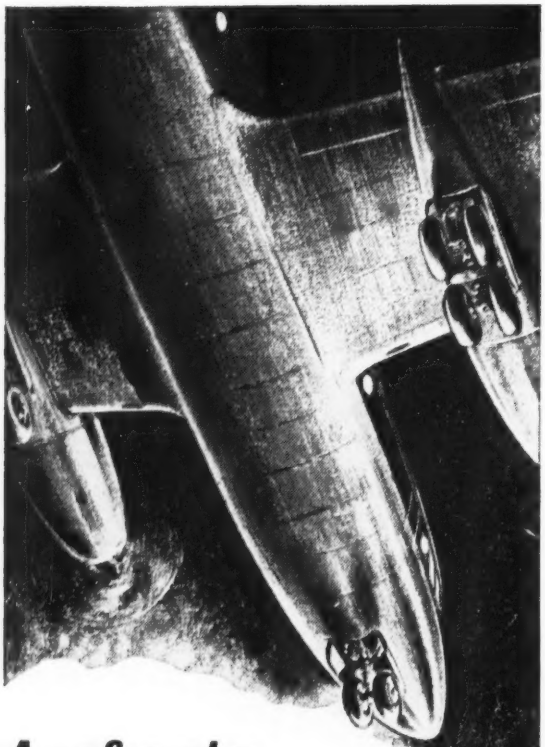

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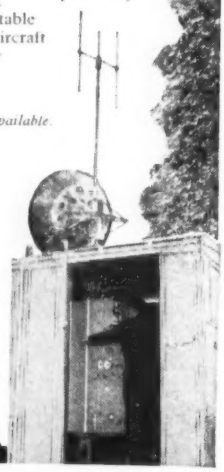

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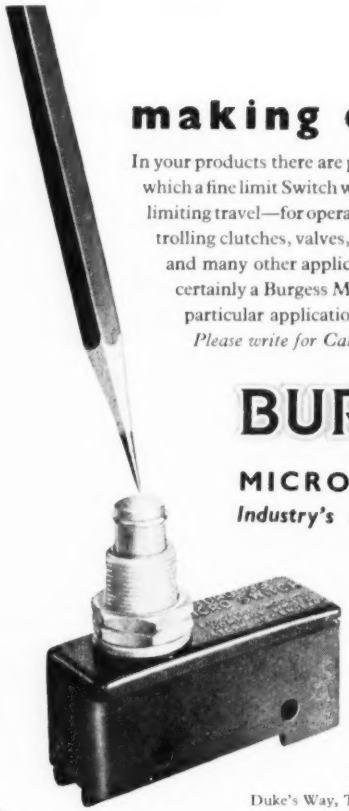

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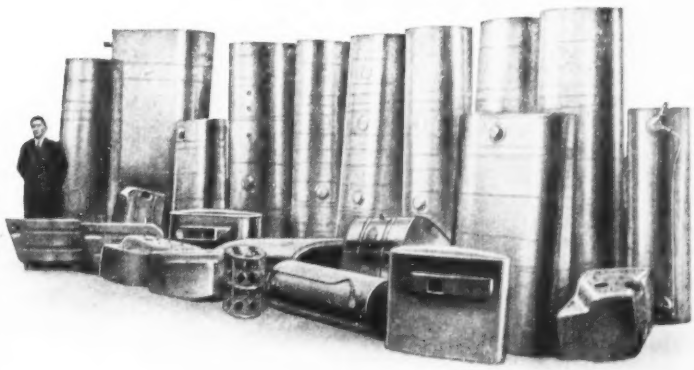

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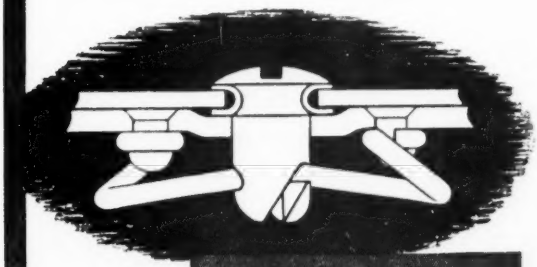

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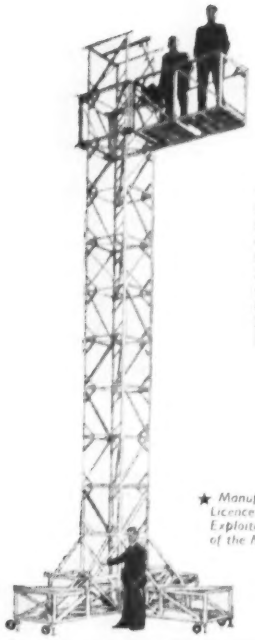

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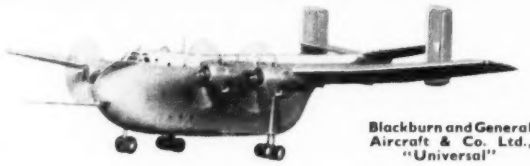

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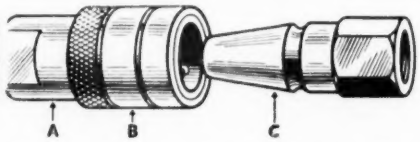

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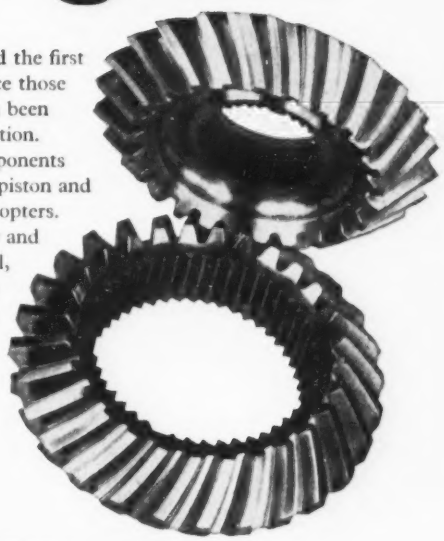

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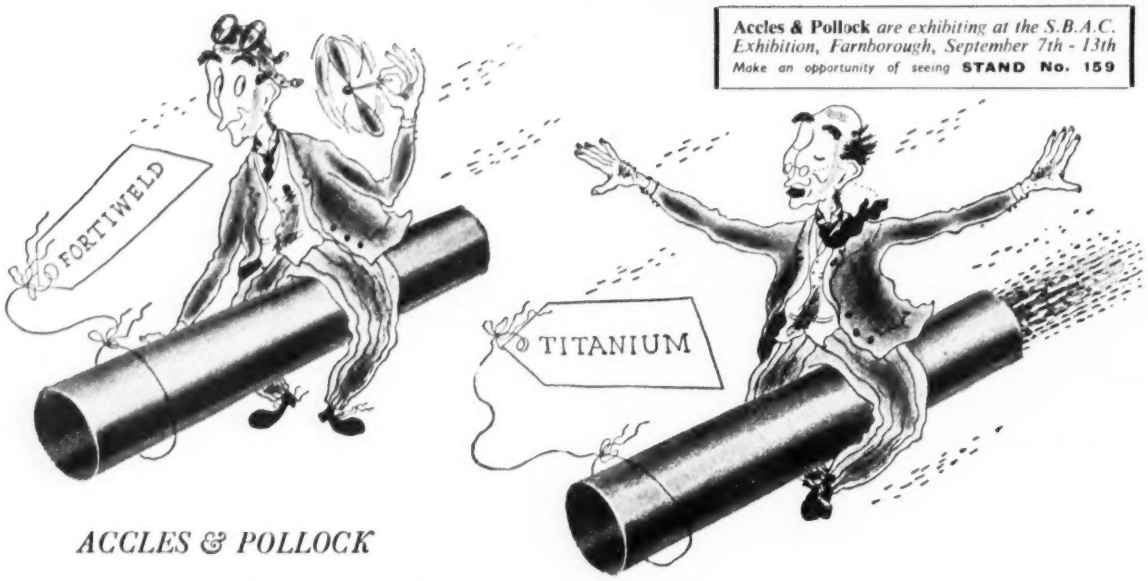

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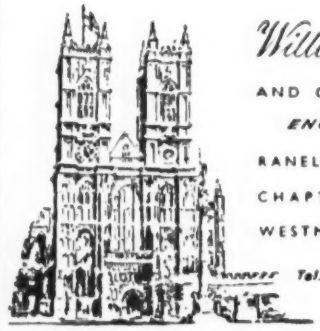

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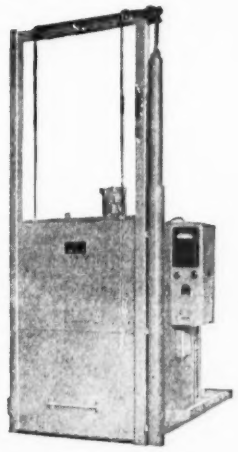

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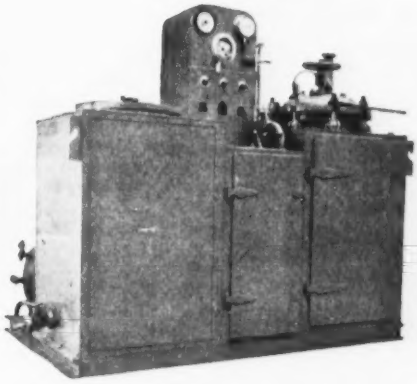

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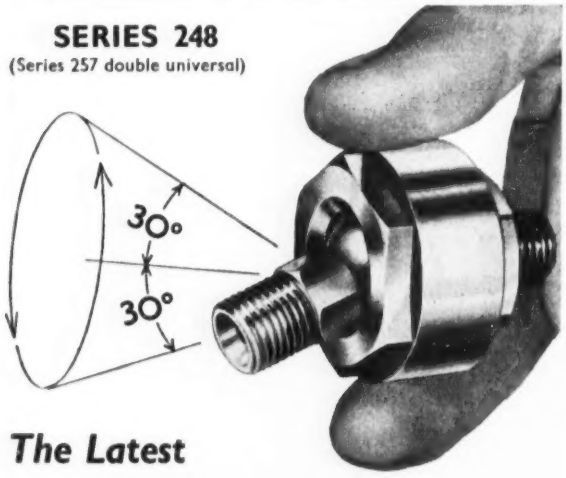

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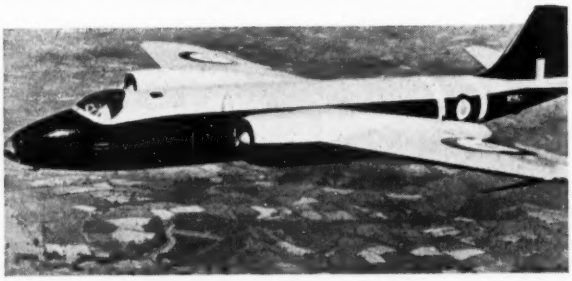

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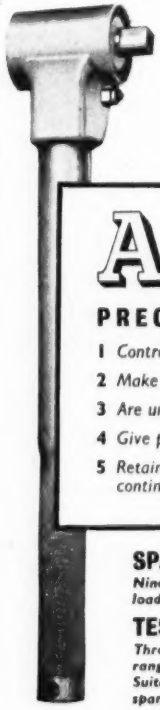

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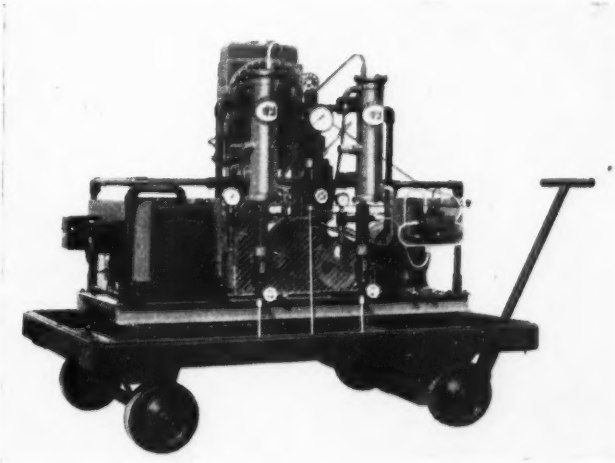

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WE welcome our old friends who make the yearly pilgrimage to Farnborough from the ends of the earth, at the same time we feel that a list of low-priced though excellent aeroplanes is not the way of greeting them. We have, therefore, decided to devote this brief column to some interesting facets from the historical pageantry of Aviation Sales.

THROUGH the kindness of the Secretary-General of the Royal Aero Club, we were able to examine recently an aircraft sales catalogue of pre-14/18 war vintage, issued by the Aeroplane Supply Company of 111 Piccadilly, W.1! The address was, of course, at once intriguing and there were some good offers:

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"ASTRA" type Bayard-Clement—complete with 120 h.p. four-cylinder motor—£10,000.

READING through this catalogue, wrapped in interest, Horace, our tame stressman, has been able to arrive at three very sound conclusions.

FIRSTLY: From the early days Piccadilly has been, amongst other things, the home of aeronautical bargains.

SECONDLY: Over the last 40 years prices of used aircraft have varied little despite certain small technical advances (see Farnborough if in doubt).

THIRDLY: As 111, Piccadilly was in those days able to provide the right thing to the right man at the right moment, so is 175, Piccadilly today.

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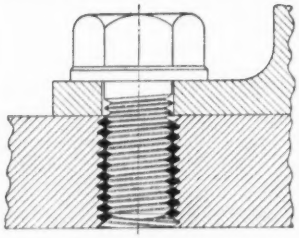

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WHILST you are here we should be delighted to see you at our London or Croydon offices so that we may give you our personal attention and advice in the supply of aircraft and everything pertaining to them.

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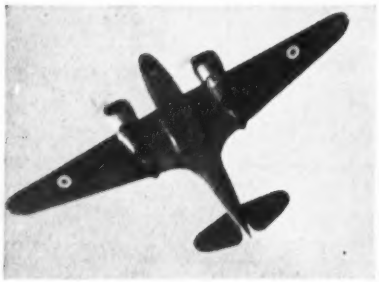

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FURTHER details and forms of application available from High Commission of India, General Department, Aldwych, London, W.C.2, quoting No. 6/4E. Last date for receipt of applications October 31, 1953. [9965

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URGENTLY required, one technical author, electrical experience essential, for preparation of technical publications. Applicants should have practical experience of aircraft electrical installations and some knowledge of English grammar.—Reply to Box 0295. [9990
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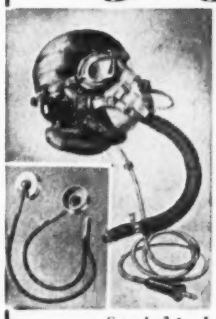

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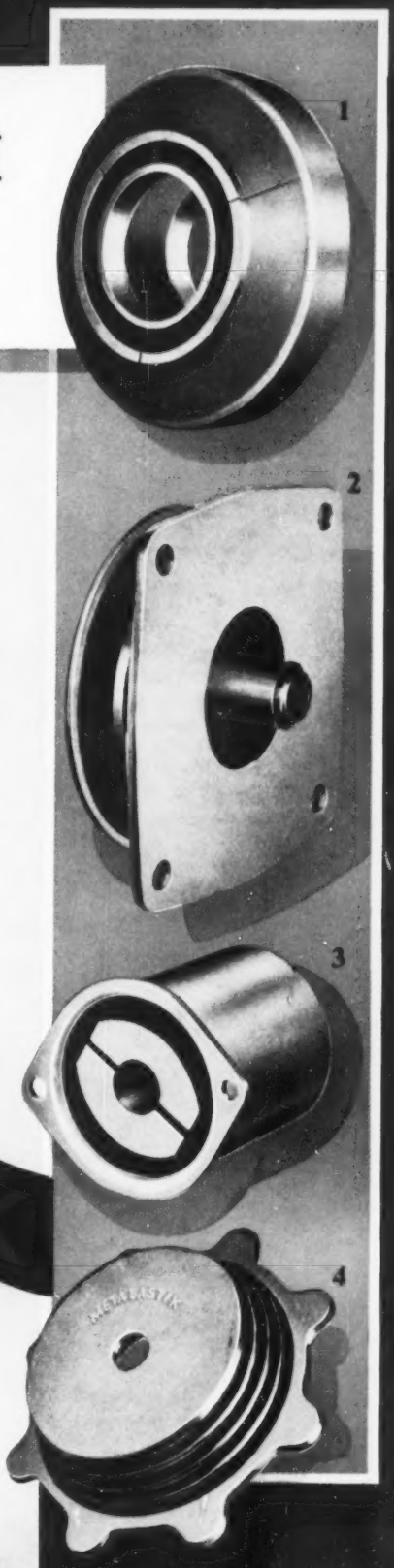

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